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WESTERN AUSTRALIA.

GEOLOGICAL SURVEY.

BULLETIN No. 29.

A Report upon the Geology, together with a Description of the Productive Mines,

OF THE

CUE AND DAY DAWN DISTRICTS,

MURCHISON GOLDFIELD.

PART I.

CUE AND CUDDINGWARRA CENTRES.

BY

HARRY P. WOODWARD,
Assistant Government Geologist.

Issued under the authority of the Hon. H. Gregory, M.L.A.,
Minister for Mines.

WITH THREE MAPS AND FIFTEEN PLATES OF SECTIONS.

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1907.

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Part I.

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Report upon the Geology together with a description of the Productive Mines of the Cue and Day Dawn Districts.

PREFATORY NOTE.

The work of constructing a geological map of the Cue and Day wn districts was commenced as far back as 1902, when Mr. W. ampbell, Assistant Geologist, spent some months in the dis- t. on account, however, of his services being required in another lity the work was suspended, but a preliminary map of the auri- us reefs of Cue and Day Dawn was issued in 1903 with notes n the mines, as Bulletin No. 7.

This work was, however, resumed in May, 1906, by myself, h the assistance of Mr. H. W. B. Talbot, Field Assistant, who de a very complete and accurate topographical survey of the strict, contour lines being run at intervals of 10 feet in altitude, d the area covered being 66 square miles.

Upon the map thus prepared the geological features, with the sitions of the shafts and dry-blowing patches, have been laid wn, whilst the plans of the underground workings as far as tainable have been reduced and reproduced in plate form.

For the convenience of reference the geological map has been ided into three sections, but these can be joined together if so sired, as they slightly overlap.

Owing to the rather voluminous character of the report it has een issued in two parts, the first of which is confined to the Cue d Cuddingwarra centres, and the second to the Day Dawn, a considerable portion of the latter being occupied by a fairly elaborate report upon the Great Fingall Mine, which not only deals with it from a geological standpoint, but also from that of a mining ngineer.

The whole concludes with an appendix by Mr. E. S. Simpson, B.E., F.C.S., etc., Mineralogist and Assayer to the Department pon the petrology of the district.

A very complete index to the names, places, reefs, etc., occurring in this report has been prepared by Mr. P. J. Atkins, clerk to the Department.

HARRY P. WOODWARD,
Assistant Government Geologist.

Geological Survey Office,
Perth, May 1st, 1907.

PART I.—CUE AND CUDDINGWARRA CENTRES.

SECTION I.—THE CUE MINING DISTRICT.

(With Geological Map).

GENERAL.

The township of Cue, which is the official centre of the Murchison Goldfields, is situated upon the Northern Railway, 262 miles from Geraldton, the port, the latter being connected with Perth by the Midland Railway, the distance being 306 miles ; it is 1,485ft. above the sea level, and lies upon the western edge of a broken granite plateau, which extends for a considerable distance to the eastward. There is a slight but general fall from Cue to the north, south, and west, but the whole of the drainage eventually finds its way towards Austin's Lake, which lies to the southward.

Generally speaking the surface is fairly flat, the only hill of any size being the Cue Trig., which rises immediately to the eastward of the town and attains an elevation of 1,630ft. above sea level ; the remainder consists of small flat-topped hills, the ruins of the granite plateau which formerly spread over the greater part of this area.

The water supply of the town is obtained from Jack's well, situated about 10 miles to the northward, being pumped to the supply tanks upon the Cue hill, from whence both this town and also Day Dawn are reticulated.

Fresh water is met with in sinking at a depth of about 100ft. all over the district, but with the exception of the Mafeking, the supply from the mines is not great, in fact barely enough for their own requirements.

The average rainfall is about 8½ inches, but with the exception of a few small tanks used in catching the water from the houses for domestic purposes, no scheme of water conservation exists.

From the following table showing the rainfall for the last 10 years with the number of days upon which it fell, it will be noticed that the fall is extremely variable :—

Year.	Yearly Total.	No. of Days.	Year.	Yearly Total.	No. of Days.
1897 ...	6·58	32	1902 ...	9·00	32
1898 ...	5·34	29	1903 ...	5·96	42
1899 ...	3·46	30	1904 ...	12·29	42
1900 ...	19·75	52	1905 ...	8·14	44
1901 ...	4·81	27	1906 ...	10·50	39

76654

HISTORICAL.

Cue may be regarded as one of the old mining districts of this State, starting its existence in the year 1891, when Tom Cue discovered gold upon what is now known as the "Patch," which was very productive during that and more particularly the following year.

During the course of 1892, the main patch was practically worked over, but a new discovery was made of what is known as the "Pearling Ground," which lies more to the eastward and differs from the "Patch" in the fact that nearly all the gold was found in the form of "specimens" (*i.e.,* gold attached to quartz) upon the surface of the shallow clay which overlaid the rock.

This ground was worked in a systematic manner by the diggers, who, finding that much time was wasted by wandering round over the same ground time after time, organised themselves into a corps who might be seen day after day pacing across the area like a line of troops in skirmishing order, each armed with a forked stick with which to turn over the stones.

Although many reefs outcropped upon these areas they were mostly of little value and bore no relation to the rich strewn quartz, the origin of which will be dealt with later on.

In this same year attention was first attracted to the reefs, Pead and Edwards pegging out what is now the Cue 1, and Prendergast the Rising Sun ; two other reefs in the same locality called at the time the Harp of Erin and the Phœnix were in all probability upon what was later on known as the Lady Mary line. In the centre of the town, upon what was later known as the Catalpa, a claim was also pegged, which was called the Lady Kintore; whilst O'Neil and Jackson also had a reef about 1½ miles to the north-east of Cue, which is in all probability the Golden Stream.

With the year 1893, this field may be said to have changed from an alluvial diggers' camp into a mining centre. Numbers of reefs were opened up, and several passed into the hands of companies which for the most part in the first instance were South Australian.

During the next year a considerable boom took place in this district, when the agents from the British and Continental speculator scoured the country ready to purchase or take options upon anything showing gold ; these properties were at once placed upon the London market and floated with large nominal and small working capitals, machinery was ordered and shipped, and managers appointed.

The sudden demand for machinery put up its price, and a considerable quantity of very inferior stuff was purchased, which, landed on the ground with heavy cartage added, represented a very considerable figure.

PHOTO. 1.

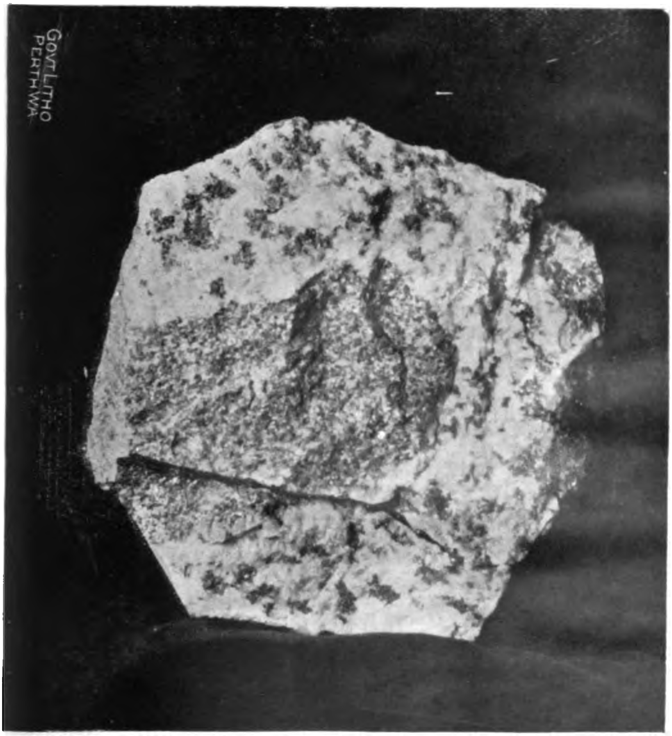

Photo., R. H. Irwin.

A specimen of Granodiorite showing segregations.

When the erection of these plants was undertaken, vital parts were generally missing, which were sometimes found later on under the sand upon the Geraldton beach, or it was discovered that they had been carted to other mines, sometimes at considerable distances.

In many instances after the plant and buildings were satisfactorily erected, it was discovered that no development had taken place, and there was neither stone nor water available for crushing, which being the case, the long expected return not coming in, the investors removed their money to Coolgardie, and a little later, to Kalgoorlie, which mining centre had just started at this time to create a sensation ; the consequence being that most of the mines around Cue were closed down and the plant sold for what it would fetch.

A few of the companies lingered on for a few years, but they eventually, with the exception of one or two, also wound up when the properties passed into the hands of local companies or private individuals. In spite of everything, however, this district has, since the earliest reliable records appear, been a steady producer of from 15,000 to 20,000 ounces of fine gold per annum.

Of many of the old mines there exists absolutely no record, and as no attempt has been made to unwater them since their abandonment many years ago, valuable bodies of stone may exist in them. Also in other cases large low-grade ore bodies may be found to enclose the small rich veins originally worked, the latter only being payable at the time owing to the crude treatment without cyanide extraction.

A very considerable profit has been made by treating the sands from these old mines, but as the result has not been added to the original crushing returns these are incomplete, whilst no record at all of crushing prior to 1896 appears to exist, except in the case of one or two of the principal mines.

The question of testing these old abandoned mines is too costly a matter for the ordinary prospector, and would have to be either undertaken by a company or a person with capital, for not only would machinery be required, but a considerable outlay upon securing and unwatering the old workings before an inspection could be made, for in most cases all accessible timber has been removed from the shaft collars, etc.

The Government have spent a considerable sum in this district upon subsidising prospecting the lodes at a depth, but so far for various reasons the work has not been successful. There is no State Battery at Cue, but no trouble has been experienced in getting crushing done upon satisfactory terms, owing to the fact that no less than three privately owned batteries undertake crushing for the public.

Appended will be found a return giving the quantity of stone crushed each year and the gold yielded in fine ounces since 1897, whilst prior to that date it is given approximately. This table shows that a total of 233,602 tons of stone crushed yielded 212,855 ounces of fine gold, or at the rate of .91 ounces per ton.

* *Table showing the Annual Production of the Cue District.*

Year.	Ore Crushed.	Gold therefrom.	Rate Per Ton.
	tons.	ozs.	ozs.
Prior to 1897	16,882·00	20,827·00	1·23
1897	26,270·50	20,527·54	·78
1898	32,482·35	22,037·29	·67
1899	17,058·27	21,869·47	1·28
1900	17,461·00	18,383·98	1·05
1901	17,493·55	18,755·54	1·07
1902	21,528·93	21,016·82	·97
1903	22,480·50	20,688·78	·92
1904	18,912·50	15,286·71	·88
1905	19,074·89	15,125·05	·79
1906	23,077·00	18,337·11	·79
Total	**233,602·49**	**212,855·29**	**·91**

One very serious question in this district is and has been for a considerable time the timber and fuel supply. With the object of alleviating this, it has been proposed to construct a light railway line, but this if run for wood alone in this sparsely timbered country could not possibly pay interest, leaving the sinking fund out of the question. If on the other hand it were constructed so as to serve outlying mining centres, the inhabitants of these would naturally object to the country surrounding them being depleted of timber and firewood in order to supply other districts.

The recent discovery of coal upon the Greenough River gives promise of an early settlement of this fuel question, whilst the timber one could be more economically solved by a concession on the freight rather than the construction of a valueless railway line.

DESCRIPTIVE GEOLOGY.

The geology of the Cue district although presenting many features which are in common with those of the other mining centres, varies considerably not only in the nature of its rocks, but in the mode of occurrence of its ore deposits.

The general conditions under which gold deposits occur in the crystalline series in this State are in more or less lenticular shaped amphibolite belts, the longest axis of which has a north-westerly direction, it being surrounded or sandwiched with gneissic granite, the whole being intersected by numerous felspathic dykes.

---

* This Table includes—Cue, 201,952·85 tons for 169,433·53 ounces; Cuddingwarra 26,644·25 tons for 35,461·78 ounces, and district generally 4,649·64 tons for 7,959·98 ounces.

PHOTO. 2.

Geological Survey. *Bulletin No. 29, Part I.*

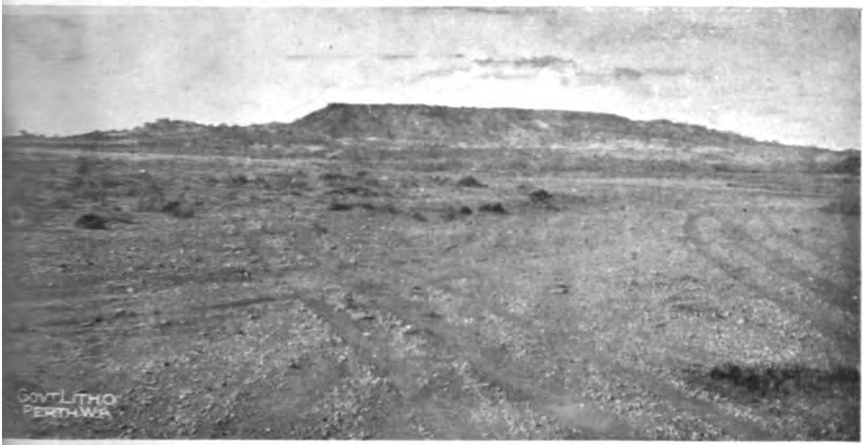

Photo., H. P. Woodward.

Table Top Hill from "The Patch."

PHOTO. 3

Geological Survey. *Bulletin No. 29, Part I.*

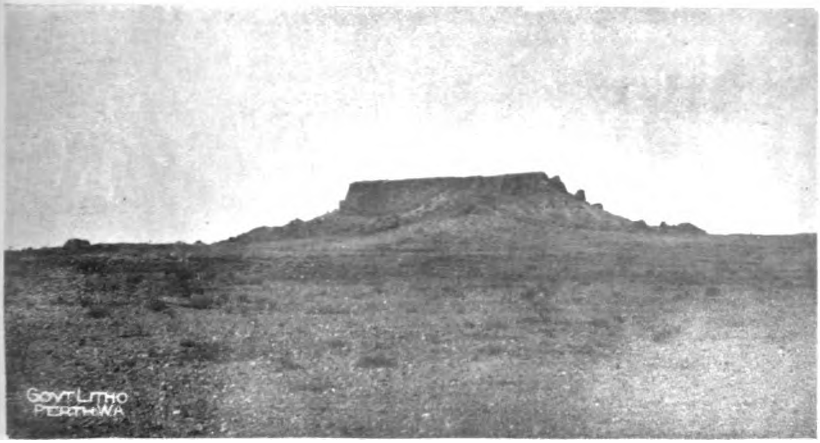

Photo., H. P. Woodward.

The Flat-topped Hill from a distance.

The quartz reefs, except upon very rare occasions, are confined exclusively to the basic rock areas, and although they are never auriferous without acidic rocks are present in the vicinity, the lines of greatest enrichment may be so far distant that it is difficult to recognise any relationship, whilst when they do occur near the granite they generally assume a course more or less parallel to the junction of the two formations and may therefore be classed as parallel contact fissures.

In the district which is at present under review the amphibolites are only developed to the south-eastward corner, and are more coarsely crystalline in structure than is usual in the auriferous belts whilst the quartz reefs in them are of an extremely rare occurrence, but those which have proved to be of value adopt the usual course lying more or less parallel to the contact, but dipping towards it. When however we come to the acidic series, a great change is apparent, for here instead of the gnessic granites we have a magmatic intrusion of grano-diorite, a rock intermediate between the hornblende granites and the quartz diorites containing numerous rich reefs which not only lie parallel to the contact but more commonly radiate from it.

The following extract is taken from Mr. S. Goczel's report of 1895, who was at that time Field Geologist to the Government, and had visited this district in 1894:—

> Northwards from the Lake Austin depression and rising as we proceed in that direction extends the Cue-Day Dawn basin, in which the two central townships of the Murchison Goldfield and also the principal mines belonging to those two places are situated, numerous quartz reefs and also dykes striking in various directions, but most of them having a westerly underlay accompany a large break through the country.
>
> This break has a north-easterly course and passes immediately to the west of the Cue township. It follows more or less a junction between gneissic granite from the west and altered schists from the east.
>
> For considerable distances on both sides of the junction and chiefly along lodes and faults, the country formation has suffered alteration. In the Archaean granite the felspar becomes kaolinised and the mica (biotite) by removal of bases and hydration, changed into foliated talc. The schistose palaeozoic greenstones (chiefly felspar-amphibolites) were altered into a kind of chloritic schist.
>
> Immediately to the east of the Cue Township, a greenstone range rises to a height of a hundred or more feet above the level of the streets and at a short distance to the north several flat-topped isolated elevations, with steep declines, attain a height of from 30 to 60 feet above the general surroundings. Those isolated elevations or " table tops " as they are locally called, are remnants of an upper archaean stratum, the bulk of which was removed by lacustral denudation. At one time they were islands in an extensive inland lake, the old strands of which are often met with in the surrounding country.
>
> The " table-top hills " consist of rotten gneissic granite. They owe their resistiveness (which has preserved them during the attacks

of the lacustrine waves) chiefly to quartz lode formations, which with their branches and veins extend along and partly also through the hills.

Depressions in the rotted gneissic granite on the tops of the hills contain remnants of conglomerate and sandstone beds which, although no palaeontological proof exists, most likely are of Cambrian age.

The reefs which are situated to the west of the main break have, as country formation, more or less decomposed gneissic granite; and those situated to the east, altered schists.

Some of the lode fissures outside the first named formations are very wide, and contain besides bands of auriferous quartz, large gangue formations, consisting chiefly of talcose kaolin, this latter being apparently derived from rotted granite country rock and was carried into the fissures in mechanical suspension by percolating water. On the contrary the seams and veins of auriferous quartz were chemically deposited and this class of lode can be ranked under the compound lodes.

The intersection of reefs with cross reefs and cross fissures plays here also an important role in the occurrence of gold shoots. The shoots in lodes which have archaean rocks as country formation, have usually a larger horizontal extent within the lode than shoots in lodes within palaeozoic greenstones, although phenomenal richness goes more with the latter class.*

At the time of Mr. Goczel's visit sufficient work had not been done in mines within the granite area to reveal their true character, he therefore naturally classed the kaolinised surface rock with the gneissic granites of the other fields.

In the year 1895, this State was visited by Herr Karl Schmeisser, who in 1898 in his work on the Goldfields of Australasia makes the following reference to the Cue and Day Dawn districts:—

†*Gold Reefs in West Australian Goldfields.*—The gold deposits of West Australia which occur in the crystalline schists are of peculiar interest both geologically and economically.

The country rock of a large number of gold veins consists of a rock which is locally called diorite by the miners. This designation ought to correspond to granular plagioclase hornblende rocks. Although such true diorites do occur in the Murchison districts as the country rock of the veins, the greater majority of so-called diorites have a more or less schistose structure, and consist essentially of hornblende, as has been proved by the examination of a large number of samples collected by us on the spot. These rocks may, therefore, best be designated as amphibolites.

The rock specimens examined were taken from the following localities in the Murchison goldfield:—

Trenton Mine, near Day Dawn.
Vein within the quartz-bearing diorite of the Lady Mary Mine, 100 feet level, near Cue.
Emperor Mine, near Day Dawn.
Cuddingwarra, near Cue.
Day Dawn Mine, near Day Dawn.

---

*Report of the Department of Mines for the year 1894. Appendix 4, report on the interior gold region of W.A.

†"Goldfields of Australasia" by Karl Schmeisser and Dr. Karl Vogelsang, translated by Henry Louis, M.A., published by McMillan and Co., London, 1898.

These rocks, when fresh, have mostly a dark green colour. Macroscopically they appear to consist essentially of a mixture of hornblende crystals which sometimes reach the size of 2mm. In most rocks the mixture is a very intimate one. Wherever a felspathic constituent plays any important part in the composition, it can be readily distinguished macroscopically in slightly decomposed rock by the presence of small whitish spots; many of the rocks show more or less distinct schistose structure.

Mining operations have shown that the amphibolites are decomposed to a very great extent, from the surface down to a depth of from 70 to 150 feet. There are a comparatively few places where they outcrop in an undecomposed condition; and are quarried for building material. When decomposed, they are converted into ferruginous gray, yellow, light or dark brown, soft and friable masses.

Under the microscope the essential constituent is seen to be green, strongly pleochroic hornblende; epidote, chlorite, quartz, and carbonates also occur, and, in a subordinate degree, biotite, apatite, titanite, zirkon, magnetite, ilmenite, and leucoxene. Hornblende always occurs in irregular fragments. In sections it is usually observed cut parallel to its longitudinal axis, frequently aggregated in approximately parallel bundles. Individual crystals are often shattered at their ends; cross-sections are rare, and a very decided parallelism is often noticeable in the direction of their length; frequently the quite irregularly formed sections have a rugged appearance. Foreign inclusions seem to be rare, though occasionally a few scattered grains of ore are seen. Epidote occurs at times in large isolated crystals, but generally in granular aggregates. Dirty green chloritic matter is abundant.

Generally there will be found between the hornblende a colourless, apparently xenomorphous mass, which from its behaviour between crossed Nicols seems to consist of a mosaic of quartz and felspars. The quartz is often rich in fluid inclusions. Twinning is rare in the felspars, and when it occurs is generally limited to the existence of two individuals with one single twinning plane, such as is generally characteristic of albite. Repeated twinning is exceedingly scarce. The mosaic of quartz and felspar is always traversed by large numbers of microlites of hornblende.

In the amphibolite from the Emperor Mine, quartz and felspar are found intermixed in such a manner as to form a very pretty graphic granite. Here and there larger portions of felspar are saussurised, and are replaced in the section by spots which appear of a dull white colour in diagonal light. Under the microscope these are seen to consist of an aggregate of irregularly disposed prisms and grains of zoisite, which, when of larger dimensions, show very distinct cleavage, straight extinction, and in other directions their steel-blue colour of polarisation. In the saussuritic parts the almost colourless zoisite is at times accompanied by slightly larger grains of greenish-yellow epidote. In these aggregates the partially preserved polysynthetic twinning of the former felspathic substance is often seen forming a kind of background. The existence of garnet, scapolite, or of any zeolitic mineral in this saussurite could not be proved. Zoisite occurs in the form of independent crystals in the rock mass, as well as in the saussuritic portions.

Highly refractive grains of titanite, which sometimes show a speck of ore as a kernel, are often arranged in rows or streaks. The scales of ilmenite are frequently coated with a skin of leucoxene. Many specimens are relatively rich in carbonates, which occur partly as thin dendritic films between the particles, and partly as larger grains with rhombohedral cleavage.

As the amphibolites form huge masses imbedded within the crystalline schists, and, moreover, frequently show a thoroughly well-marked slaty structure, it seems right to look upon them as genetical equivalent to the latter. This conclusion is apparently contradicted b the occurrence of amphibolites in a dyke about three feet thick whic traverses the quartz diorite at the 196 feet level of the Lady Mary Min at Cue, so that the eruptive origin of the former rock appears to h clearly shown here. Although there are no indications that this dyk was of a diabasic nature at an earlier period, and the amphibolit does not contain the remains of any pyroxenic constituent, still apparently the only possible explanation is that this dyke was originally diabase, and has been converted into amphibolite by the pressure of the surrounding strata ; this explanation has been accepted in numerous similar cases. The fact of this occurrence of amphibolite as a dyke does not render it impossible that the other huge masses of amphibolite are diabase rocks metamorphosed and rendered slaty by pressure. Possibly when their geological relations have been more completely investigated, other evidence bearing on this point may be forthcoming.

In the Murchison goldfield, quartz-diorite of almost granitic appearance occurs over an extensive area to the north of Cue. and to within about three miles to the south of this town, between the crystalline schists which lie to the east and west of the former rock. This rock is much decomposed to depths of 90 to 100 feet and converted into a friable kaolin-like mass, generally white, but often of a brownish colour. At a depth of 90 feet it has been met with in the Light of Asia gold mine in a tolerably good state of preservation.

A sample of the undecomposed rock from the 196 feet level of the Lady Mary claims was examined.

This quartz-diorite is tolerably coarse-grained, so that its constituents can be recognised by the naked eye. It approaches to tonslite in its almost equal proportions of biotite and hornblende. The rock must be considered as retaining in its present condition its principal primary characteristics, and cannot be regarded as an alteration product of diabase. Although at times the plagioclase felspars appear under the microscope to be rich in fine, very pale, green particles of hornblende, these cannot be considered as having been introduced secondarily, because they are often limited to the kernel of the felspar, which then shows an exterior zone perfectly clear and tolerably fresh. That the latter is no secondary growth is shown by the well-marked continuous direction of extinction of many of the crystals.

The quartz-diorite is traversed by numerous reefs striking and dipping in all directions; the thickness of these varies within considerable limits. Thus in Princess Ada it is in places seven feet, in the Red, White and Blue Mine eight feet, and in Light of Asia nine feet; it does not as a rule, however, average more than three to four feet.

The main constituent of the reef matter is a hard white quartz of irregular lenticular structure; between the quartz and the generally well-marked walls of the country rock a layer of kaolin occurs, containing numerous grains of quartz, and therefore sharp and granular to the touch; its colour is white, or at times light yellowish or brownish. This kaolin is obviously a product of the decomposition of the country rock.

The gold occurs principally in the body of the quartz, more rarely in the accompanying kaolin, generally finely disseminated, but often in specks visible to the eye, or in larger particles. In Cue 1 mine up to the time of my visit 1,089 tons of ore had yielded 1,750 ounces of gold, or an average of 1oz. 12dwt. 7grs. to the ton. In the Light of Asia the ore was said to have averaged 19dwt., in Princess Ada 24dwt., and in the Arcadia 2oz. 16dwt. to the ton. My samples from the Arcadia, however, gave me only 19dwt. 14grs. to the ton. As the reef outcrop almost invariably shows a certain enrichment in the gold contents, it is very doubtful whether these values will continue in depth.

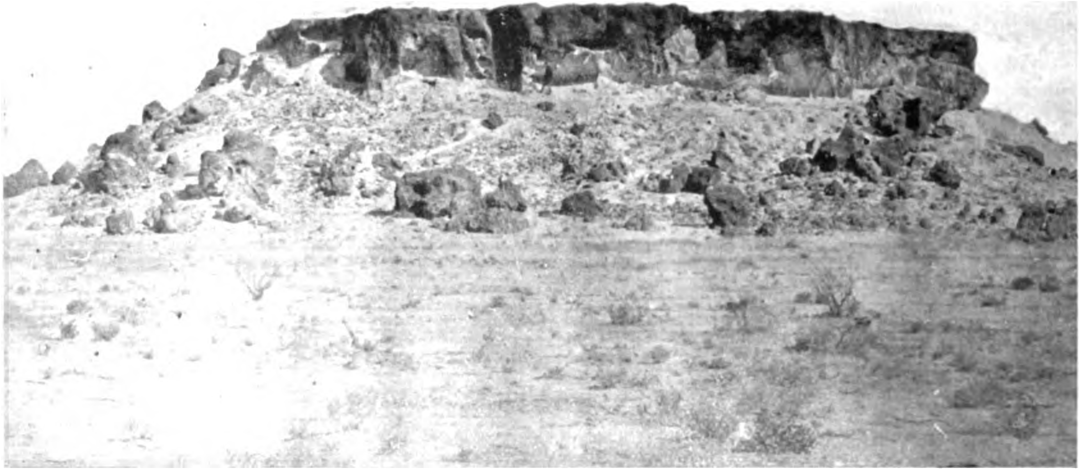

Photo., H. P. Woodward.

The Flat-topped Hill.

In the Murchison Goldfield the behaviour of the reefs in their longitudinal extension and in depth is very irregular. Some show an amount of regularity which justifies good expectations in both depth and extension; others wedge out rapidly in both directions, or pinch to such a degree as to arouse serious misgivings. Dykes of amphibolite, which may be looked upon as an altered diabase, frequently occur.

A portion of the Red, White, and Blue reef appears to be a contact vein between quartz-diorite on the footwall and amphibolite on the hanging-wall.

Well-marked slickensides are frequently found in the vein-matter.

The zone of decomposition of the reef matter extends to very different depths in the different mining districts. In Cue, for example, it extends to a depth of from 60 to 70 feet, in the Menzies and Kalgoorlie districts to an average of from 130 to 180 feet, but even within the same mining district the depth will be found to vary.

The country rock is generally decomposed to quite the same depth as the veins themselves.

The reefs are occasionally traversed by cross-veins carrying gold, by diabase and other dykes, and by fissures generally combined with faults, normal or reversed, though these occurrences are not very frequent.

With regard to the origin of the veins, I expressed myself as follows in my short report, dated January, 1896:—

"The simple veins, as also the composite veins, are as a rule to be looked upon as mineralised fissures. Their formation was due generally to faulting of the strata, usually normal, more rarely reversed. In the case of composite veins, when these movements took place, they produced great pressure on considerable portions of the country rock, which was shattered. The pulverised rock lying between the hanging- and the foot-wall became partly metamorphosed by mineral solutions, and formed the vein matter. Slickensides are very frequent and must have been produced by pressure. The simple quartz reef and the composite vein are, however, only extreme types of vein formation, for veins are to be found in all stages of development between them. The transition forms, which are as a rule much poorer than the typical composite veins, are also frequently, although erroneously, called lode formations by the Australian miners, with the object of giving the deposit an appearance of greater value."

The following is a more or less detailed description of the rocks, dykes, and quartz reefs of the district ending with the conclusions deduced from a careful personal study of them in the field during the year 1906.

The formations exposed upon this field differ from those of the Eastern goldfields in that they cannot be divided simply into two main groups of crystalline and superficial, inasmuch as an intermediate series of ancient volcanic rocks and some scattered patches of elastic rocks, consisting of quartzite and breccia, are met with here capping several low hills.

Amphibolites.—Undoubtedly the oldest rocks of this district are the greenstones, which are only met with in the south-eastern portion of this district; they consist of dark green hornblende and felspar, often schistose, and have been classed under the heading of amphibolites in order to distinguish them from those of a more massive and decidedly intrusive character.

These rocks pass imperceptibly from red greasy clays into chloritic, serpentine and hornblende schists, then into a massive crystalline rock of possibly diabasic origin.

This gradual change in both the character of the rock and its mineral contents is due to hydration and shearing, but whether they are of igneous origin or not has not yet been conclusively proved. although it is highly probable. The main mass of the Cue Hill is composed of rocks of this class as well as the range which runs from it in a north-easterly direction, but they are of little economic value upon this field since in them very few auriferous reefs have been discovered, and the few that have lie for the most part in or near the contact zone.

Grano-diorites.—The grano-diorite, as its name implies, is neither a true granite or diorite but is a quartz diorite with a granitic structure weathering after the type of true granite to a gritty white kaolin. In composition it varies considerably as also do the proportions in which the various minerals exist, it being sometimes almost destitute of quartz, whilst at others mica (biotite) is almost absent, and again augite may predominate over the hornblende, or that mineral may be entirely absent.

In the massive rock, segregations often occur (Photo No. 1) which owing to their fine crystalline structure and darker colour greatly resemble diorite, but upon examination in thin section under the microscope they prove to have the same composition as the coarse crystalline portions of the rock except that they contain a larger proportion of hornblende.

This rock covers by far the larger proportion of the area embraced by the geological map, occupying all the central and north-western sections.

It appears to be a magmatic intrusion into the amphibolites, occurring as a belt which runs in a north-easterly direction about four miles in width ; the western boundary of the formation is not included in the Cue sheet but will be seen in the Cuddingwarra which joins it.

Very considerable interest attaches to this formation since it contains by far the larger number of the productive lodes, and upon its surface the alluvial patches were discovered.

One of the marked features of Cue is its isolated marquee shaped hills called "table tops," which hills rise abruptly to a height of about 60 feet above the surrounding country, but present a much more striking appearance when seen at a distance than when viewed close to their bases, thus a much better conception of them can be obtained from the photographs (Nos. 2 and 3) than from those of the individual hills taken closer.

In section these hills consist of layers of soft white kaolinised granite at the base, with hard reddish cappings of the same rock,

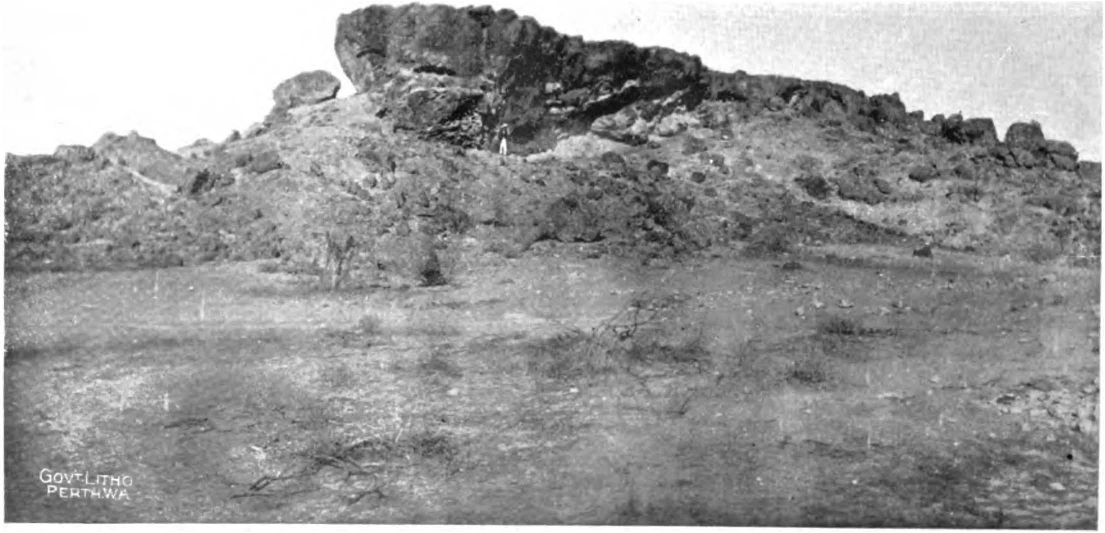

Photo., H. P. Woodward.

The Point of Flat-topped Hill.

which owes its weather resisting character to iron oxide which has been drawn up in solution by capillary attraction through leaching of the rocks below.

These table top hills represent the ruins of a once extensive plateau, the whole of which was most probably covered by a ferruginous conglomerate, traces of which are still met with upon the tops of these hills, and in fragments around their bases.

The breaking up of these granite sheets was commenced by meteoric waters permeating surface cracks which were gradually cut out until they became stream channels or gorges. The hard crust having thus been penetrated and a cliff-like face exposed to the action of the weather, it only became a matter of time for the wind to slowly but surely dig into the softer gully beds, thus leaving the capping masses unsupported, when they naturally toppled over. In order to illustrate this action which is taking place to-day a series of photographs have been taken and reproduced ; the first, of the "flat top" (Photo. Nos 4 and 5), which shows the overhanging capping and soft underbeds and talus resulting from the ruin of the harder layer ; the second is of the "hanging rock" (Photo. No. 6), which illustrates how the last remnant of a hill capping is gradually travelling down a slope to the flat below ; and the third, called the "elephant rock" (Photo. No. 7), is of one of these masses which has safely alighted upon the flat, and all the *débris* of the softer beds having been removed the wind has now started to work around and under this boulder by removing it grain by grain as it frets away.

Dykes.—Dykes both acidic and basic are numerous in this district, intersecting both the granitic and the amphibolites. The basic, which are either epidiorite or fine grained grano-diorite, occur either parallel to the contact or radiate from it, following generally the same course as the quartz reef and occupying the same fissure; whilst the acidic, which are either felsites, quartz porphyries or granites follow no definite courses, but usually cross the other series at an obtuse angle (Photo. No. 8.)

Epidiorites.—From a point behind the hospital, which is at the south side of the town a line of disturbance extends in a south-westerly direction along the contact zone to the edge of the map. This consists of a magmatic intrusion, the rocks being either diorite or epidiorite, which latter probably results from the paramorphism of the diabase.

Volcanic.—The volcanic rocks proper occur just within the greenstone area along the contact zone a little to the eastward of the town upon the Cue Hill, from which point they extend both in a north-easterly and south-westerly direction forming a narrow belt of hill capping.

The Cue Hill itself is capped by a sheet flow of this hornblende andesite which in places is of a vesicular character, the cavities representing the gas or steam bubbles contained in the rock mass when it was in a molten state ; in some instances these cells have been filled with secondary minerals mostly quartz, when they may be classed as amygdaloids.

In these rocks the flow structure is often distinctly visible, whilst in others the weathered faces present a brecciated appearance which clearly indicates the cracking of the flow surface whilst cooling and its subsequent re-cementation.

Upon this hill there are two main dyke masses of this rock near its western base close to the railway line, these in all probability represent the necks up which the lava flowed ; whilst the crater, which would have risen to a considerable elevation above the hill top has been entirely removed.

These rocks although of absolutely no economic value in themselves may possibly have played a most important part in the formation of the fissures which contain the auriferous veins, since these not only radiate and dip in all directions from them, but also carry their highest values near them.

Clastic.—The clastic rocks are represented by a series of hill-cappings of quartzite and breccia which run for about 1¾ miles in a south-west direction from the racecourse, maintaining a distance of about one mile from and parallel to the contact zone.

Along this line between the various cappings, the surrounding flats are thickly strewn with fragments of boulders of the rocks, proving conclusively that this formation at one time formed a continuous sheet covering a considerable area which had a gradual fall to the south-west, representing in all probability an old valley in the grano-diorite tableland, into which highly siliceous thermal waters were discharged in the form of hot springs from the cooling volcanic region.

Laterites.—In this district laterites are of rare occurrence, and when they are met with it is as small hill-cappings, but to judge from the ferruginous nodules and traces of conglomerate met with upon the tops of the granite table hills, and the great extent, particularly in the north-western portion of this area over which detrital matter of a lateritic character is spread, this formation must in the past have covered a very considerable extent of country.

Recent.—Under the heading of recent and superficial deposits are included the alluvium of the creeks and flats, which is fairly extensive but of little thickness ; also the ferruginous cement, which is lateritic in nature but generally more or less detrital ; this latter may be only a few inches in thickness with protusion of weathered rock showing through here and there, or may attain a thickness of as much as six feet, in which case it is generally covered by a shallow alluvial deposit. Since it was found to be impossible to map in its

PHOTO. 6.

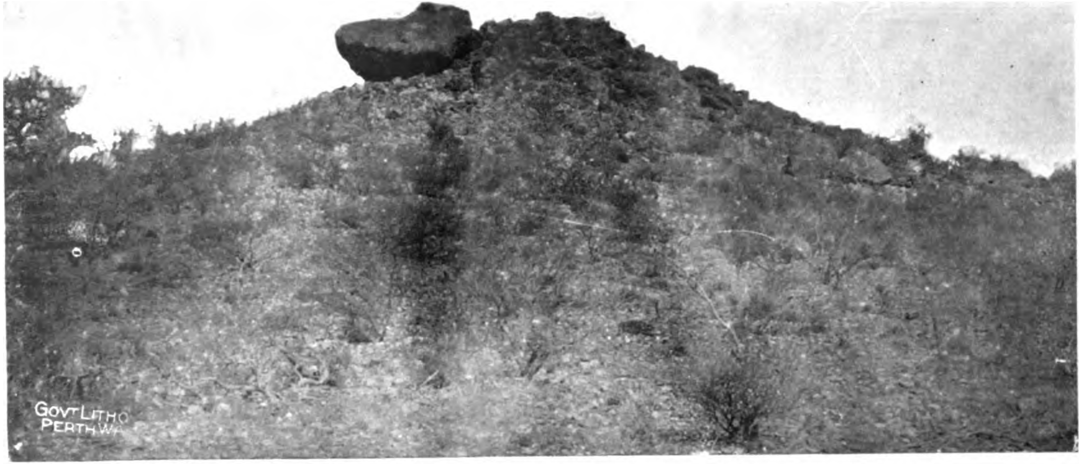

Photo., H. P. Woodward.

The Hanging Rock.

boundaries, it has been classed as rock when of little thickness with frequent rock outcrop, and as alluvium when thick and overlaid by clay or loam.

These deposits have proved to be of considerable economic value in places, for all the rich dryblowing patches belong to this group of superficial deposits, and usually occurring where this formation is very thin, bearly covering the weathered crystalline rock at points where they are intersected by numerous dykes and quartz reefs, the gold occurring as strewn rough particles or still united to fragments of its quartz matrix.

Quartz Reefs.—The main group of auriferous reefs near Cue are located within the grano-diorite area and may be classed under two headings. 1st, those which follow a course more or less parallel to the junction of these rocks with the amphibolites and dip in a northerly direction may be called *parallel contact veins* ; 2nd, those which radiate from the contact zone dipping generally in a westerly direction may be called *radiating reefs.*

These two classes of reefs so far as developments have proved differ very slightly in character, they rarely exceed a dip of 45 degrees, and invariably occupy a dyke fissure, and the quartz body is usually of a more or less lenticular character, whilst a number of these bodies may be so arranged as to present the appearance of a continuous line of outcrop a mile or more in length.

These lenticular bodies appear to be arranged with their longest axes inclined to the northward, which has given rise to the theory that the auriferous shoots dip in that direction.

In sinking one of these lenticular masses is met with below the other, sometimes being actually connected by a thin sheet of quartz, whilst in others small quartz veins may penetrate the dyke mass, in which case it is often found that the next make of stone is upon the opposite wall of the dyke.

The dyke masses themselves, which are of a basic nature, often carry a very considerable quantity of pyrites, but have so far in no instance proved of sufficient value in gold to be worth working.

Besides the two classes of reefs in the granite area referred to above, a series of what may be called flat reefs occur a little to the northward of the town beneath the "Patch," the rich dryblowing area from which a very large quantity of alluvial (?) gold was obtained.

These reefs are not of great richness, but owing to their size and the cheapness with which they can be worked they have been one of the mainstays of the district.

There is also a group of reefs to the north-westward of the area upon which a considerable quantity of work has been done, but these need no further description since they are identical with the radiating series.

In the amphibolite area there is about one-tenth of the auriferous reefs of this district, and these have yielded about one-twentieth of the total gold production. They for the most part follow a course fairly parallel to the contact, but do not present such long lines of outcrop as those in the granite, neither do they appear to follow dyke fissures.

In the radiating series the zone of enrichment has been supposed to generally dip to the northward upon the inclined plane of the lode, but since with one or two exceptions no work has been done below the water level, which would represent from 150 to 200 feet upon the underlay, very slight data is available upon which to arrive at a definite conclusion upon this point.

In two mines only at the present time are attempts being made to solve this important question : these are the Salisbury and the Cue No. 1, in the former of which a well-defined rich shoot of stone was worked down to the 200 feet level; this was supposed to dip from the surface to the northward, but upon driving north at the 250 feet level upon the lode no stone of value was cut, and upon investigation it was found that the rich stone pinched out a little below the 200 feet level.

The 250 feet level was then driven south, in which direction what appears to be a new make of stone was cut, and should this prove to be the case this new lens will lie directly below the first, and may thus form one of a series of lenticular masses, one below another, each individual body of which being inclined to the northward, but taken as a whole representing one shoot dipping in the same direction as the reef. (Fig. No. 1.)

Upon making further enquiries into the character of the vein worked in the upper levels it was discovered that no such thing as a continuous shoot of stone existed, since the upper portion of the rich reef was upon one side of the dyke mass and the lower upon the other, therefore it is clear that two distinct lenses have already been worked, but since the upper workings are inaccessible it is impossible to investigate into their characters.

In the case of the Cue No. 1, which was originally worked by a company until their managers supposed all the payable stone worked out recommended its abandonment, when it passed into the hands of the present owners, who discovered another body of stone of equal size and richness to that already worked. This in time also gave out, after which no attempt was made to prospect for a fresh body below the No. 4 level, with the exception of one winze, in which it is stated certain values were met with. However a new main shaft was sunk at a considerable distance to the dip which cut the reef at a depth of 530 feet from the surface, the latter being then driven upon for a considerable distance both north and south without results.

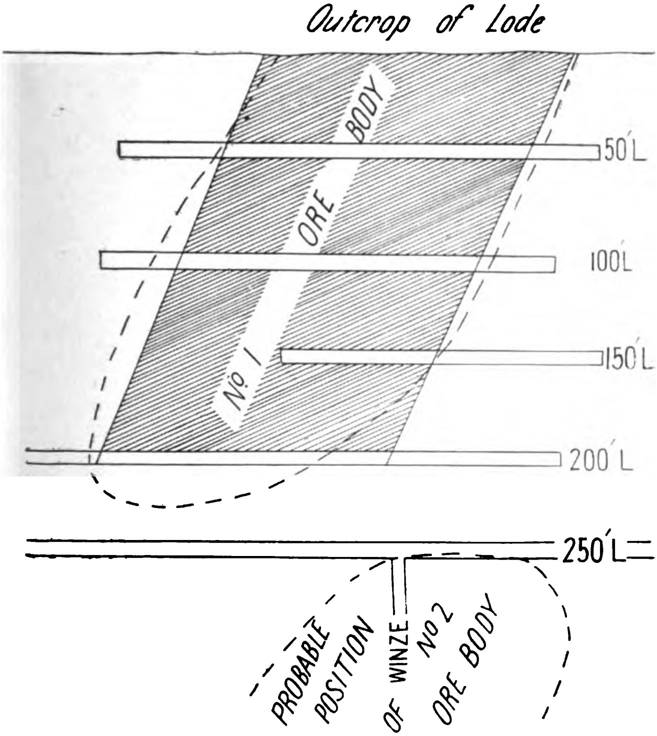

FIG I

DIAGRAM OF THE SALISBURY MINE

PLAN UPON LODE PLANE

STOPED........................ ▨

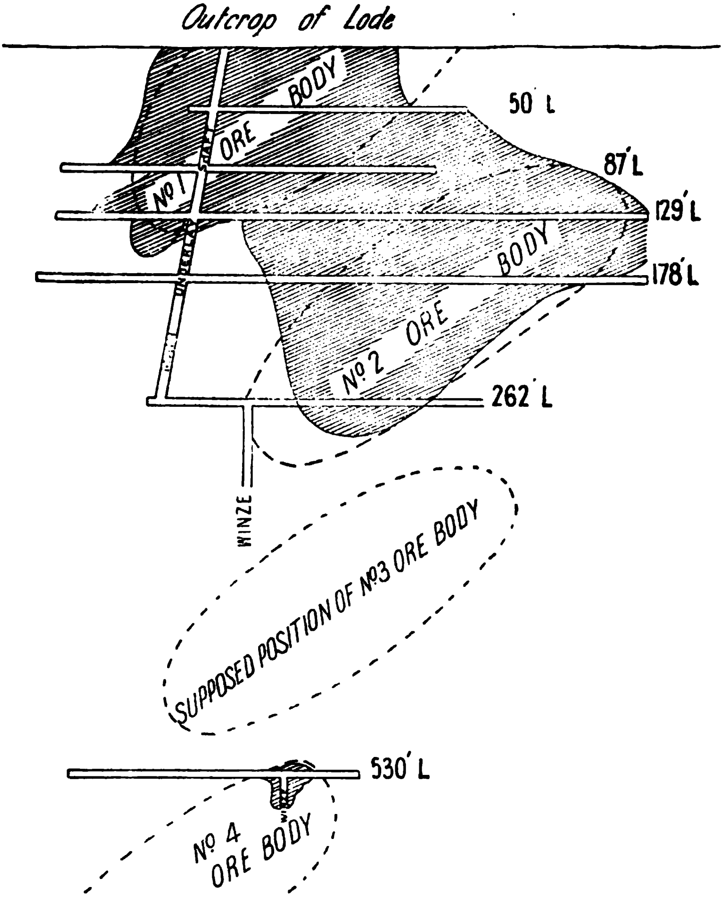

FIG. II

DIAGRAM OF THE CUE Nº I MINE

PLAN UPON LODE PLANE

STOPED .... ▨

Like the Salisbury mine, the old upper workings in this mine are inaccessible, whilst no surveyed plan exists of the work done since the days of the company, therefore it is impossible to express a definite opinion as to what has taken place, the only point which seems clear is that at least two distinct lenses were worked in the upper levels, the lower of which died out just below the No. 4 level; this being the case it would have been wiser to have sunk three or four more winzes from the bottom level for a distance of 50 feet each upon the lode before undertaking the work now in hand.

It is quite possible that the 530 feet level now being driven may have passed between two lenses of quartz, and that the stone carrying values now being winzed upon north of the shaft may prove to be the apex of a new make; should this prove to be the case it is quite possible that another lens exists above this level between it and the No. 4. (Fig. 2.)

Another question that deserves attention is that of the sheet reefs below the "Patch," for since these exist one below another it is only reasonable to suppose that others underlying them will also exist and prove to carry values, and should this prove to be the case it will be of very great importance to the district. This question could be simply and cheaply tested by a series of bore holes put down to a depth of about 250 feet at points where the existing reefs have proved to be richest.

Some boring has been done to a considerable depth upon the westward side of the "Patch" and the northward of the Cue No. 1, but from only one of these are any values reported, whilst these, although high, do not appear to be very authentic since the company had not sufficient confidence in it to test it by shaft sinking.

Alluvial deposits.—Correctly speaking there are no alluvial deposits which contain gold in this district, but several extensive patches over which the detrital matter from rocks and reefs has been spread have proved highly remunerative to work. From these a very considerable quantity of gold was won in the early days of this field, in fact it was due to the discovery of one of these that attention was first directed to this locality. It is quite impossible to form any idea with regard to the quantity of gold obtained from these deposits since no official record was kept prior to 1896, by which date the greatest number and the richest of them were practically worked out.

The original main deposit, known as the "Patch," which is situated upon the northern boundary of the township of Cue, was very productive, the gold occurring in a quartz-strewn formation which rarely exceeded one foot in thickness. It was usually of a ragged or flaky character and often attached to fragments of quartz, which clearly demonstrated that it had not been subjected to the concentrating action of running water.

Considerable prospecting was done upon the outcropping reefs from which it was supposed to have been shed, but these as a rule proved to be either of low-grade or barren, and it was not until the nature of the area was more clearly demonstrated that any solution as to its origin could be propounded.

With the development of the reefs, however, it was discovered that a series of horizontal payable quartz bodies extended beneath this area, therefore it is quite possible that another such body, although in all probability much richer, existed above them, and that it was from the disintegration of this flat upper reef *in situ* that the gold and quartz found upon the surface were derived, the smaller and lighter particles of rock and quartz having been removed by the action of the wind.

The origin of the gold upon the "Pearling Ground" is by no means so clear, since there is no indication in this locality of the existence of flat reefs, whilst the reefs that do outcrop, although sometimes found to contain phenomenally rich patches, have never developed into consistently payable properties. Owing, however, to the fact that so much of the gold that was discovered was large and rough and often still adhered to or was contained in fragments and lumps of quartz, it is clear that this deposit was not formed by gradual concentration from the detritus of rocks and reefs containing minute quantities of fine gold, but from the disintegration of quartz veins of considerable richness.

The other smaller deposits in this district resemble more closely the ordinary dry-blowing patches met with upon the Eastern Goldfields, the presence of the gold being easily accounted for by the concentrations from weathered rock containing small veins of auriferous quartz.

It will be seen from the above that although this district owed its start to the richness of these deposits, they have not so far led directly to the discovery of any payable reefs.

General.—From a careful examination it would appear that the amphibolite series represents the oldest rocks of this district, but whether their origin was igneous or sedimentary it is impossible to say; judging, however, from the nature of that portion which remains, they were probably of igneous origin, because neither calcareous nor arenaceous beds are met with, which would be the case if they resulted from metamorphised sedimentary rocks.

Next in antiquity to the amphibolites come the epidiorites, which are of undoubted igneous origin; then the granodiorites, which occur as a magmatic intrusion, causing a certain amount of regional metamorphism to take place in the basic series along the contact zone. During the period of cooling these rocks appear to have cracked, whilst into the fissures thus formed molten matter was intruded, which although of the same character as the granodiorite cooled more rapidly and in consequence formed a finer grained rock.

PHOTO. 7.

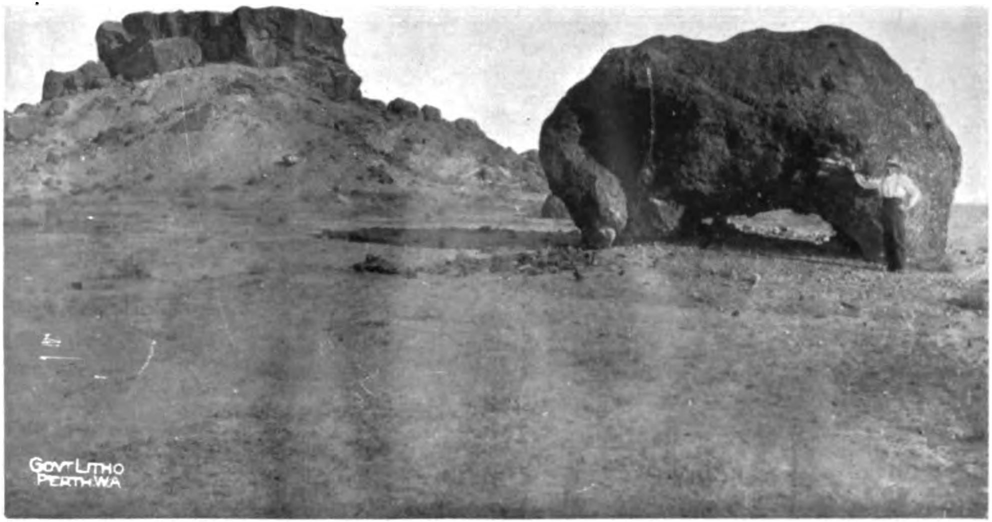

Photo., H. P. Woodward.

The Elephant Rock.

At some later period the pent-up forces of nature took advantage of the line of weakness at the contact of the amphibolites with the granodiorites and burst forth as a volcanic eruption at a point somewhere near the present Cue hill, remnants of the lava poured out are still upon the top of the hill, which at that time in all probability represented the level of the country.

These eruptions would in all probability extend over a considerable period, during which the dyke fissure lines would be subjected to considerable vibration if not actual movement, whilst later, as the internal heated mass began to cool, shrinkage and subsidence would take place accompanied by movement along these lines, with considerable grinding along the walls of the fissures, particularly when convex surfaces were brought together, and a corresponding opening out where concave surfaces were opposed.

Later on these cavities were filled by the deposition of silica and other minerals from the heated waters which traversed them, and these in time became the quartz reefs of to-day which lie upon one or the other wall, as the case may be, or cross the dykes at points where they have been crushed or broken. At some later period another series of irregular fissures were formed which were filled with felspathic material now forming the quartz porphyry dykes which intersect indiscriminately rocks, dykes, and quartz reefs without apparently producing any other influence upon them than perhaps a slight throw or faulting.

Some time during the later stages of cooling, but subsequently to the formation of the quartz reefs, a certain amount of hydrothermal action must have taken place which formed the large sheet of secondary silica breccia, the remnants of which are represented to-day by small hill cappings and strewn fragments.

Since the period of volcanic activity, denudation has steadily but surely been at work removing all vestiges of what must have been a volcanic crater, leaving now only the dyke-like mass representing the vent up which the lava was forced, which is now at an elevation considerably below the flow which caps the hills.

This denuding action appears to have proceeded until the auriferous portions of the reefs were reached, for had the removed portions contained gold, large and rich deposits would have been accumulated in the alluvium, whereas the only superficial deposits (incorrectly classed under the name of alluvial) in this district that carry gold are of a distinctly æolian detrital character, the gold occurring upon the surface of the ground either in the form of ragged pieces or still associated with its quartz matrix.

Summary.—In conclusion it may be stated that the reefs of this district are of the fissure type, in which fissures, also, considerable movement has taken place, as is proved by the polished and striated walls and ground-up rock material between them and the reef.

Since these fissures contain dykes of igneous origin, their extent in depth may be looked upon as considerable.

Whilst the reefs themselves, where opened up and worked, have proved to be of considerable value, but not to consist of one continuous body but a series of lenticular masses, the relation of which to one another it is impossible at the present time to determine, owing to the fact that they were not studied at the time they were accessible, therefore the prospecting for the lost shoots at the lower levels has to be carried out in a more costly manner than would have been necessary had more accurate information been available about those portions of the reefs already worked.

SECTION II.—THE MINES OF CUE.

GENERAL.

The general character of the ore deposits of this district having been fully dealt with in Section I. of this report, the following portion is devoted solely to a more or less detailed description of the individual mines, including their production, size, and character of the ore body, nature of the enclosing rock, depth of water level with quantity and quality, and the extent of the workings, plant, etc., the whole being accompanied where possible by mine plans and sections.

The collection and compilation of this information has necessarily entailed a very considerable amount of time and labour, because out of the 90 reefs described only 30 are held at the present time, whilst out of this number, only 25 were being worked during 1906.

Information regarding the underground workings of abandoned and inaccessible mines, which could only be inspected at the surface, has been in part obtained from the following official resources :—"Report on the Interior Gold Regions of W.A." by S. Goczel, Field Geologist, Department of Mines, 1894 ; "Annual Reports of Frank Reed, Inspector of Mines, Central Goldfield, 1895-6" ; "Bulletin of the Geological Survey Department No. 7" ; "Auriferous Reefs of Cue and Day Dawn," by W. D. Campbell, Assistant Geologist, 1903, supplemented by that kindly supplied by Messrs. Cheeson, Hayden, and Lloyd.

In order to verify the information gathered from these various sources, the plans of the underground workings were consulted when obtainable, but when these did not exist a careful surface examina-

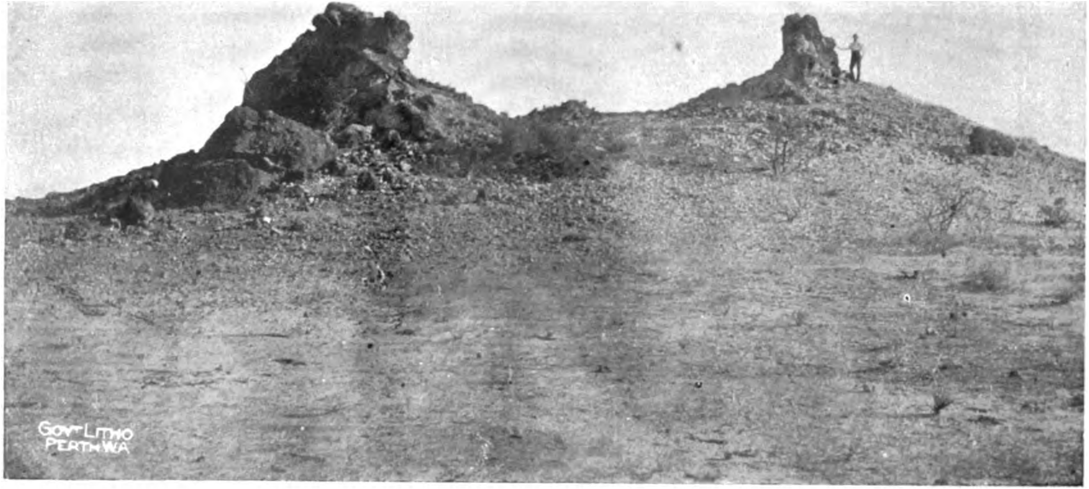

Photo., H. P. Woodward.

The Pinnacles.

on was made, due consideration being given to the tonnage of stone reported to have been raised as set forth in the official statistics.

When possible, plans of the underground workings were secured, either by actual survey or from the owners, which, together with those already in the record office of this Department, have been reproduced in order to make the context as intelligible as possible; but as a number of these were made many years ago it is highly probable that they are not up to date, since many of the mines have been worked between the time of their abandonment by the original companies and the present.

All the figures in the tables of production have been obtained from the Statistical branch of the Mines Department, but owing to the fact that this field was discovered in the year 1891, and that it was not until 1897 that it became compulsory for owners of leases to report monthly to the Government the quantity of the stone treated with the yield of gold therefrom in ounces, therefore little reliance can be placed upon figures relating to returns prior to the latter date.

Some of the early records include the returns not only from a group of mines worked by one company, but often from those situated at a considerable distance when belonging to the same owners, and this renders it quite impossible to arrive at anything like a reliable estimate of the individual production.

At the end of 1906 there were 58 gold mining leases in force in this portion of the district, but of these only 25 were productive, the balance being held either for area or to secure the underlay of the reef at a depth.

Owing to the heavy cost of working mines in the early days before this district was connected by a railway many were abandoned, which under the more favourable conditions existing at the present should pay well to work, therefore with the object of stimulating the gold mining industry a system has recently been inaugurated of publishing a list of the abandoned leases in each district together with their yield; this list, although of considerable interest and value, does not go quite far enough since many of the reefs from which gold was won in the past have been abandoned and taken up again, and are now being worked either under other names or even in some instances the same name but with different lease numbers, although the original leases show as abandoned in the list.

In order to illustrate this a reference to the following table of productive leases (p. 74) will make it clear that there have been 161 of such at one time or another in this district, whilst out of this number 131 are shown as abandoned and 30 as existing, now as there are only about 90 reefs from which gold has been won it follows that many of these leases refer to the same area, and in fact at the present time no less than 22 are being worked as new leases.

would bring the value up to about .75ozs. per ton for the stone crushed.

The Monte Carlo, G.M.L. 1530.—Adjoining the Mafekin upon the east is a parallel reef in kaolinised granite which is being worked by a series of shallow shafts in the soft country.

The quartz is of a white glassy nature sometimes showing grains of gold in cubical cavities from which pyrites has evidently been leached, but of which no trace remains, not even iron stains.

During the year 338 tons of stone have been raised and treated with the result that 198.46 ounces of fine gold were obtained, or at a rate of a little over half an ounce per ton.

City of St. Petersburg G.M.L. 764 (abandoned).—About a quarter of a mile in a south-easterly direction from the Monte Carlo are some old workings upon a reef which apparently has a north-easterly course and dips to the north-westward. The country, judging from the dumps, seems to have been a decomposed hornblende schist representing in all probability one of the greenstone dykes which so commonly accompany the reefs in this district. [6863.]

This mine was worked before the year 1897 under the name of St. Petersburg, but during that year and the following it was called the Lady Godiva.

Table showing the Yield of the City of St. Petersburg Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1896	City of St. Petersburg, G.M.L. 764 ...	10·00	4·52	·45
1897	Lady Godiva G.M.L. 1116	30·00	22·81	·76
1898	Do. do.	177·00	91·35	·51
	Total	**217·00**	**118·68**	**·55**

The Two Nations G.M.L. 865. (abandoned).—Adjoining these last-mentioned leases to the south-westward are some more old workings from which there is a record of 10 tons having been crushed in the early days of the field which yielded 9.05ozs. of fine gold.

The Kangaroo G.M.L. 672 (abandoned), Plate 1.—This mine is situated upon the same line of country and about half a mile south-west of a reef striking in a north-easterly direction dipping to the north-westward at an angle of about 48 degrees, and varies from a few inches to five feet in thickness.

Upon this reef a main underlay shaft has been sunk to a depth of 240 feet, from which a level at 75 feet from the surface was driven for a distance of 150 feet south and 114 feet north to the air shaft, and for a further distance north of 186 feet. A second level was driven at 110 feet (water level) for a distance of 22 feet north.

All the stoping has been done between the upper level and the surface, a spur or cross reef strikes off from the hanging wall side of the lode having a more westerly course, and upon it a vertical shaft has been sunk, cutting it at a depth of 90 feet where it was driven upon for a distance of 45 feet.

Table showing the Yield of the Kangaroo Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1897	Kangaroo, G.M.L. 672	253·00	130·79	·51
1898	Do. 672	56·00	28·01	·50
1899	Do. 672	9·00	2·71	·30
1902	Do. 1306	160·00	97·95	·61
1903	Do. 1306	294·50	185·18	·62
1904	Hard Nails, G.M.L. 1439	13·50	11·05	·81
1905	Do. 1439	33·00	12·13	·37
	Total	**819·00**	**467·82**	**·57**

Between the years 1897-9 it was worked by a company who had a 10-head stamper mill and other machinery, after which it was not worked for two years when it was again taken up by a local syndicate who worked it for a further period of two years. In 1904-5 a small portion covering the old workings was taken up under the name of Hard Nails, but at the present time all work has ceased. The early results do not include sands treatment, which are reported to have yielded by cyanidation at a later date 3dwts. 3 grains per ton, which would bring the average up to well above the half-ounce of fine gold per ton.

The Leviathan G.M.L. 183 (abandoned), Plate II.—This lease adjoins the Kangaroo upon the south-west side, the reef being apparently contained within the same line of fissure, but the quartz vein is not continuous.

The mine has been opened upon a large quartz blow, which strikes north-north-east and dips to the westward at an angle of 50 degrees. The reef lies between a greenstone footwall and a granodiorite hanging wall, it varies in thickness from 2 to 10 feet and has been followed down by an underlay shaft to a depth of 260 feet, where it is from 6 to 7 feet in width carrying a little galena.

The No. 1 level was driven at 50 feet from the surface for a distance of 30 feet north and 110 feet south to the No. 2 shaft, then on for another 40 feet to the No. 3 shaft. Above this level for the last 100 feet at the southern end all the stone has been stoped to the surface.

The No. 2 level has been driven at 185 feet from the surface for a distance of 10 feet north and 110 feet south to the No. 2 shaft, but only a small stope has been carried up above this level to a height of 50 feet and for a length of 25 feet. The No. 3 level wa driven at a depth of 235 feet for a distance of 40 feet south, and rise put up to the No. 2 level.

It was worked continuously by a company from 1897 to 1902 who had certain plant upon the mine, after which it was worked by local people for two years as the New Leviathan.

Table showing the Yield of the Leviathan Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1897	Leviathan G.M.L. 183	130·00	107·01	·82
1898	Do. do.	246·00	173·98	·70
1899	Do. do.	237·00	181·78	·76
1900	Do. do.	330·00	263·67	·79
1901	Do. do.	43·00	26·95	·62
1902	Do. do.	162·50	96·01	·59
1903	New Leviathan G.M.L. 1390	259·00	94·56	·36
1904	Do. do.	47·00	79·95	1·70
	Total	**1,454·50**	**1,023·91**	**·70**

There is no record of the sands treated, but they are said to have yielded 5dwts. per ton, which would bring the total up to close upon an ounce of fine gold per ton of stone crushed.

The George Higginbotham G.M.L. 178 (abandoned). — This old mine, which was worked from 1898 to 1900, adjoins the Leviathan to the south-westward, and is apparently upon the same main line of fissure, which is traversed by the basic dyke mentioned in the description of that mine. The country here appears to be broken and disturbed by cross pegmatic dykes [3799], and as a consequence the quartz reef which strikes in a north-easterly direction and dips to the westward at an angle of 70 degrees cannot be traced for any considerable distance.

It has been opened upon by two underlay shafts, a vertical shaft and an open cut, but no information is available as to their depth or the size of the reef.

Table showing the Yield of the George Higginbotham Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1898	George Higginbotham G.M.L. 178 ...	46·50	11·70	·25
1899	Do. do. do. 178 ...	104·00	30·37	·29
1900	Do. do. do. 178 ...	27·50	37·73	1·37
	Total	**178·00**	**79·80**	**·44**

Upon the eastern side of the ridge formed by the quartz blow in the Leviathan lease a small dryblowing patch extends in a southerly direction, crossing the north-east corner of this George Higginbotham lease, whilst the south end of the reef upon the last-mentioned lease is covered by a large dryblowing patch from which a long narrow strip extends in a north-westerly direction for a distance of 35 chains, and a large wide patch southerly and westerly over the Argus lease in the direction of the Lombardy mine for a distance of 20 chains.

The Argus G.M.L. 1328, *Gem of Murchison* (abandoned).—This lease was formerly known as the Independent G.M.L.173, and formed a portion of the property owned by a company called the Gem of Murchison G.M. Ltd., who erected a 10-head mill and other mining plant upon this lease, whilst another 10-head was upon the ground, but not put up.

The area lies immediately to the south-westward of the George Higginbotham, and is apparently upon the same line of fissure but as at this end the reef is considerably broken and of little value, only a small amount of prospecting has been done upon it, the main developments being upon a series of parallel north and south reefs lying as contact veins with quartz porphyry dykes [**6856**], which came in from the Gem G.M.L. 538 at an angle to the main line.

These reefs, which have a northerly course and dip at an angle of 50 degrees to the eastward, have been prospected by a main vertical shaft sunk in the grano-diorite [**6850**], and a number of underlay shafts, many of the latter being in the adjoining lease, a portion of which is still held as the Little Gem.

This is an instance in which an area at present held will be shown in the returns as five abandoned leases.

Table showing the Yield of the Gem of Murchison Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1897	Gem of Murchison G.M.L. 538 ...	60·00	35·67	·59
1900	Gem G.M.L. 1216	32·00	14·60	·46
1900	Golden Gem G.M.L. 1220	10·00	4·74	·47
1902	New Gem of Murchison G.M.L. 1314	39·00	21·35	·54
1902	Argus G.M.L. 1328	142·00	102·02	·71
1903	Do. 1328	352·00	225·14	·64
1904	Do. 1328	326·00	180·68	·55
1905	Do. 1328	256·30	153·55	·59
1906	Do. 1328	56·00	18·13	·32
1906	Little Gem G.M.L. 1542	64·00	62·84	·98
	Total	**1,337·30**	**818·72**	**·61**

Although this production is not entirely from the same lease it is from the same reefs, and therefore they have been taken together.

The Lombardy G.M.L. 1034 (abandoned).—Upon this mine which is situated about 30 chains west of the Gem of Murchison, the British investors expended a considerable sum in the purchase and erection of plant, etc., before testing the lode. The reef has the normal north-easterly strike dipping at an angle of 50 degrees to the north-westward and is, to judge from the dumps, probably a contact vein with a basic dyke upon one or the other wall associated with a considerable quantity of pyrites and calcite.

It was developed by an underlay shaft to a depth of 260 feet, but no plans are in existence or information available as to the extent of the workings.

Table showing the Yield of the Lombardy Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1897	Lombardy G.M.L. 1034	210·00	126·22	·60
1898	Do. 1034	135·00	31·47	·23
1900	Do. 1034	Sands	57·48	
	Total	**345·00**	**215·17**	**·62**

The Jubilee, G.M.L. 1511 (Plate III.).—This mine is situated about three-quarters of a mile to the north-westward of the Lombardy. The reef strikes north-west and dips at an angle of 43 degrees to the south-west. It was originally worked by an underlay shaft to a vertical depth of 90 feet, from the bottom of which a level was driven for a distance of 30 feet to the south-east, whilst another level was driven at a depth of 45 feet from the surface for a distance of 120 feet south-east.

Later on a vertical shaft was sunk at a distance of 150 feet south of the underlay shaft to a depth of 83 feet, which is the water level. From this shaft a rise was put up to the end of the 45 foot level, and a level driven at the bottom 50 feet north-west and 40 feet south-east, from which level the ore has been stoped up to the surface.

A large porphyritic acid dyke accompanies this lode, which is called formation, and since it carries a little gold from 8 to 9 feet of it has been worked with the stone.

Table showing the Yield of the Jubilee Reef.

ar.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
7	Jubilee G.M.L. 1117	105·00	64·39	·61
8	Do 1117	744·00	230·03	·30
0	Do 1168	12·50	7·85	·62
05	Do 1511	170·00	53·62	·31
06	Do 1511	79·00	22·30	·28
	Total	**1,110·50**	**378·19**	**·34**

Highland Mary, G.M.L. 718 (abandoned).—This lease was situated upon the north side of the Gem of Murchison, the reef having the normal north-easterly strike and underlay to the westward, following a basic dyke fissure parallel to the Leviathan line. A few shallow shafts were sunk in 1897, from which 68 tons of stone were crushed which yielded 7.32ozs. of fine gold, or at the rate of about 2dwts. per ton.

Golden Leaf, G.M.L. 889 (abandoned).—This is about 20 chains to the south-eastward of the Gem of Murchison; the reef strikes in a north-easterly direction and dips to the north-east. It has not been worked since 1896, when 33 tons of stone were crushed which yielded 42.54 ounces of fine gold, or a little over one ounce per ton.

Battler's Hope, G.M.L. 1284 (abandoned).—These old workings are situated about half a-mile to the southward of the Gem of Murchison. There are two lines of reef which strike north-west and dip at a low angle to the south-west.

Upon the eastern of these a considerable amount of prospecting has been done, several vertical shafts having been sunk in decomposed grano-diorite, the deepest of which is about 30 feet

This area was held during the year 1901, when 30 tons of stone were raised and treated, yielding 8.49 ounces of fine gold, which is at the rate of .28 ounces per ton.

Red, White, and Blue, G.M.L 745 (abandoned).—This mine is situated about half a-mile due east from the George Higginbotham, and was worked until 1899 by a company who erected a 20-head stamper mill and other mining machinery, and did a considerable amount of development work.

The reef strikes in a north-easterly direction and dips at an angle of 55 degrees to the north-westward, being associated both with a basic and porphyritic dyke, the former, which often contains a considerable quantity of pyrites, being chloritic or epidote schist [6857-61, 3800-4].

A main shaft has been sunk to a vertical depth of 200 feet with a drive 300 feet north and 301 feet south, the reef varying in width from 1 to 7 feet, and pinching out entirely at the ends o the level.

There are also two underlay shafts, 90 feet in depth, which ar connected by a drive 100 feet in length in which the reef average 3 feet in width, and it is above this level that the stopes have bee carried up to the surface.

A small portion of this area, embracing the old workings, wa taken up by local men and worked during this year, 1905, as th Little Sparkler.

Table showing the Yield of the Red, White, and Blue Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1896	Red, White, and Blue G.M.L. 745 ...	100·00	89·06	·89
1897	Do. do. do. ...	241·00	93·65	·34
1898	Do. do. do. ...	737·00	301·30	·40
1899	Do. do. do. ...	25·00	6·92	·27
1905	Little Sparkler G.M.L. 745	61·00	37·48	·61
1906	Do. do.	13·50	9·32	·69
	Total	1,177·50	537·73	·46

There is no record of the value of the sands treated, subsequently, but it may be assumed that they would have brought the gross returns up to over half an ounce of fine gold.

The Victory, G.M.L., 1354, *late Buttercup* (abandoned).—This old mine is situated upon the south side of the Cue-Cuddingwarra Road, near the two-mile post.

The reef strikes in a north-westerly direction dipping to the north-east, upon which a number of shallow shafts have been sunk in kaolinised granite.

Table showing the Yield of the Buttercup Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton
		tons.	ozs.	ozs.
1897	Buttercup G.M.L. 1109	100·00	58·54	·58
1903	Victory G.M.L. 1354	249·50	133·64	·53
1904	Do. do. 1354	242·00	101·80	·42
1905	Do. do. 1354	12·00	7·30	·60
	Total	603·50	301·28	·49

The Victoria, G.M.L. 1177 (abandoned).—This reef is situated upon the Cue telegraph line at a distance of one mile from the town; it has an almost north to south course with an underlay to the westward.

A number of shafts have been sunk upon it, the deepest of which is 110 feet (water level) in decomposed granite. At this depth a level has been driven for a distance of 200 feet and a winze sunk 75 feet. In the upper workings the reef varies from 1 foot 6 inches to 3 feet in width, containing small veins and strings of quartz.

This line of fissure is evidently traversed by a basic dyke which is intersected by a large series of porphyritic dykes that may be seen outcropping at the surface and crossing it at an angle of about 45 degrees [**6875, 3805**].

Table showing the Yield of the Victoria Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1896	North Victoria G.M.L. 817	203·00	283·00	1·39
1897	Vicioria G.M.L. 1118	11·00	22·55	2·05
1898	Do. do. 1118	52·50	329·07	6·34
1900	Do. do. 1177	11·00	6·61	·60
	Total	**277·50**	**641·23**	**2·31**

The Lily, G.M.L. 1494 (abandoned).—This lease was situated about 30 chains due west of the Cue township boundary, and embraced a number of extinct leases which have been held under various names since the year 1894, when 63 tons of stone are reported to have been crushed yielding 214 ounces of gold by battery treatment only.

There is a main reef which strikes a little east of north and dips at an angle of 75 degrees to the westward, it is generally small in size, varying from 6 inches to 2 feet in width, but is of high grade.

The southern end of this reef was worked continuously from the year 1897 to 1904 under the name of the Deceiver, G.M.L. 1115, but the northern portion has been known as the Lily, Two Lilies, Deceiver North, etc.

In the years 1902-3 the whole area was provisionally amalgamated and a local company formed, called the Brilliant G.M., N.L., with the object of sinking a main shaft to the dip and southward to cut the shoot of stone at a depth. This shaft was sunk to a depth of 200 feet and the reef driven on for a distance of 66 feet, 46 tons of stone being crushed which yielded 14.54 ounces of fine gold, or a little over 6dwts. to the ton, which would not pay upon so small a body of stone.

In the old workings the reef has been driven on for a length of 460 feet at the water level which is 116 feet from the surface below this level; the stone has been stoped for a depth of 30 feet and a length of 400 feet, this stope being carried up to the surface.

In the upper workings the rock is much weathered but the vein appears to be associated with a porphyritic acidic dyke which was also met with in the solid state in the deep vertical shaft which was sunk in grano-diorite [**6878-9**].

It will be seen from the accompanying return that this vein has yielded 2,700 tons of stone which has averaged over 1¼ ounces of fine gold to the ton, whilst the sands from the early crushings are said to have been extremely rich. This is another instance in which seven abandoned leases cover practically the same area and have all been worked upon the same reef and same shoot of stone.

Table showing the Yield of the Lily Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.	TOTAL. Ore crushed.	TOTAL. Gold therefrom.	
		tons.	ozs.	ozs.	tons.	ozs.	ozs.
Prior to 1897	Lily G.M.L. 701 (119) ...	480·00	724·03	1·50	623·00	869·92	1.39
,, 1897	Do. 701 (119) ...	128·00	134·68	1·04			
,, 1898	Do. 701 (119) ...	15·00	11·21	·74			
,, 1897	Two Lillies G.M.L. 1113 ...	55·00	66·88	1·21	180·00	172·30	·95
,, 1898	Do. do. 1113 ...	35·00	19·27	·55			
,, 1899	Do. do. 1113 ...	90·00	86·15	·95			
,, 1900	Deceiver North G.M.L. 1213	44·00	70·42	1·60	168·00	337·22	2·00
,, 1901	Do. do. 1213	124·00	266·80	2·15			
,, 1902	Brilliant G.M.L. 1115 ...	31·00	5·61	·18	46·00	14·54	
,, 1903	Do. do. 1115 ...	15·00	8·93	·59			
,, 1905	Lily G.M.L. 1494	226·50	134·02	·59	226·50	134·02	·59
,, 1897	Lily No. 2 South G.M.L. 697	25·00	19·91	·75	35·00	23·57	·67
,, 1897	Do. do. 697...	10·00	3·66	·36			
,, 1897	Deceiver G.M.L. 1115 ...	31·00	48·76	1·57	1,423·50	2,117·13	1·48
,, 1898	Do. do. 1115 ...	374·00	726·60	1·64			
,, 1899	Do. do. 1115 ...	159·00	312·94	1·93			
,, 1900	Do. do. 1115 ...	172·00	237·68	1·38			
,, 1901	Do. do. 1115 ...	94·00	112·18	1·19			
,, 1902	Do. do. 1115 ...	24·00	16·42	·68			
,, 1903	Do. do. 1115 ...	325·00	445·83	1·37			
,, 1904	Do. do. 1115 ...	197·00	208·20	1·05			
,, 1905	Do. do. 1115 ...	47·50	8·52	·11			
	Total	...	...	...	2,702·00	3,668·70	1·35

The Lily North, G.M.Ls. 1049, 1131 (abandoned).—This and the Lily North Extended, G.M.L. 1131, are situated upon the same belt of country to the northward but there is no indication of the reef being continuous.

The reef is of a white nature, being enclosed in kaolin at the surface which makes into a felstone with depth and will probably be found to be a felspar porphyry below the water level [6876-7].

Little work has been done upon this reef, but the small amount of stone crushed appears to have been of high grade and when the fact is borne in mind that the sands were not treated and that battery extraction was not high in the early days of the field, the stone raised must have been rich, since 145 tons yielded 321 ounces of fine gold, which is nearly 2¼ ounces per ton.

The Old Francis, G.M.L. 1429 (abandoned).—This area, formerly known as the Francis, is situated to the eastward of the Lily, and was worked in the early nineties by a company who had a plant upon it including an Otis ball mill.

The reef strikes north-west and dips north-east, being two feet in width and upon it a vertical shaft has been sunk to a depth of 160 feet with drives at 50 and 100 feet for a distance of 200 feet, the latter depth being the water level.

About 3 chains to the eastward is a parallel reef which has been recently worked; it dips in a south-westerly direction or towards the Francis reef, but it has not yet been followed down to the junction.

These reefs appear to be spur fissures striking off into the grano-diorite from the entangled greenstone mass which passes through the Belgravia, and they are also cut into by a green felspathic dyke which has a north-easterly course [6888].

Table showing the Yield of the Old Francis Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1895	Francis G.M.L. 226	135·00	72·00	·53
1904	Old Francis G.M.L. 1429	28·00	8·00	·28
	Total	**163·00**	**80·00**	**·49**

The Belgravia, G.M.L. 1056 (abandoned).—This old mine is situated to the eastward of the Francis, close to the south-west corner of the town.

The reef has a north-west and a south-easterly course with an underlay to the north-east, the country being grano-diorite at the north but at the south the fissure extends into a branch-like portion of the amphibolites which has here been enclosed in the former rock.

The only information available is that one shaft has been sunk on the reef for a distance of 100 feet.

Table showing the Yield of the Belgravia Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton
		tons.	ozs.	ozs.
1896	Belgravia G.M.L. 1056–1057 … …	102·00	69·69	·68
1897	Do. Central G.M.L. 789 … …	90·00	60·13	·67
1898	Do. do 789 … …	73·50	38·14	·52
1899	Do. do. 789 … …	16·00	105·76	6·61
	Total … …	**281·50**	**273·72**	**·97**

Research, G.M.L. 1332, and *Royal North, G.M.L.* 1379 (abandoned).—These are two old leases covering the same ground, situated a little south of the Belgravia. The reef strikes north-east and dips north-west; little work has been done on it.

Table showing the Yield of the Research Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1902	Research G.M.L. 1332 … … …	24·00	14·92	·62
1904	Royal North G.M.L. 1379 … …	20·00	5·65	·28
	Total … …	**44·00**	**20·57**	**·47**

Real McKay, G.M.L 234 (abandoned).—A little to the westward of the town, at the junction of the telegraph line with the Cuddingwarra Road, are some old workings upon a well-defined reef from 1 foot 6 inches to 3 feet in width, which has a strike to the north-west, with a dip of 65 degrees to the south-west.

The workings consist of a number of shallow shafts and open cuts.

A spur reef with a north and south course strikes off from this reef following a greenstone dyke, upon which a little work has been done [3808, 3809].

There is only a record of one crushing from this mine, in 1901, when 40 tons were crushed yielding 13.77 ounces of fine gold.

Campania, G.M.L. 219 (abandoned).—This reef is the north-western extension of the last-mentioned, and is about 2 feet 6 inches in width. There are a number of shallow shafts upon it, and also a main vertical one 90 feet in depth, with a drive 35 feet in length at the 60 feet level.

There is only one crushing from this area upon record, which was taken out in the year 1895, it being 104 tons which yielded 41 ounces of gold.

Anglo-Saxon, G.M.L. 220 (abandoned).—This is situated upon the same line of fissure, but the reef, which has the same course and underlay, cannot be traced between the two.

Several shallow shafts were sunk, the deepest being 85 feet.

At the time of Mr. Goczel's (late Field Geologist) visit in 1894, he states that 50 tons of stone crushed yielded 137½ ounces of gold, and that 80 tons more were at grass awaiting treatment.

Maori, G.M.L. 1418 (abandoned).—This line, which is practically parallel with the last-mentioned at a distance of 25 chains to the north-eastward, strikes off from the north-west corner of the town. It has a dip of about 67 degrees to the south-west, and is about 5 feet in width, being worked from a number of underlay shafts and one vertical one to a depth of 150 feet, the water level being 125 feet.

Of this mine Mr. Goczel (late Field Geologist) says, in 1894, that 250 tons were crushed yielding over 500 ounces of gold.

This reef has since been worked under the name of the New England, and later, the Maori again.

Table showing the Yield of the Maori Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1895	Cue G.M.L. 229	592·00	473·00	·80
1897	New England G.M.L. 1107	7·00	8·23	1·03
1899	Maori G.M.L. 1157	18·00	4·91	·27
1900	Do. do.	20·00	7·61	·38
1905	Do. do.	11·00	9·22	·83
	Total	**648·00**	**502·97**	**·77**

Welcome, G.M.L. 1308 (abandoned).—This reef lies to the north-westward of the last-mentioned, it being on the same line of fissure, but the reef, which has the same strike and dip, is not continuous.

A few shallow shafts have been sunk upon the outcrop and one vertical shaft to the dip, from which 130 tons of stone were raised and treated in 1902, which yielded 46.53 ounces of fine gold.

Young Colonial, G.M.L. 1297 (abandoned).—This is a reef with a strike nearly north and south, dipping at an angle of 65 degrees to the westward lying about 10 chains to the eastward of the Maori.

A considerable amount of shallow work has been done by the various holders, and a vertical shaft sunk to a depth of 120 feet, which is the water level.

This reef is accompanied by a greenstone dyke upon the hanging wall.

Table showing the Yield of the Young Colonial Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1898	Young Colonial G.M.L. 1124	154·50	245·84	1·59
1899	Maude G.M.L. 1144	75·00	97·94	1·30
1900	Do. do. 1144	77·00	63·95	·83
1902	Young Colonial G.M.L. 1279	43·00	18·79	·43
	Total	349·50	426·52	1·22

Salisbury, G.M.L. 1374 (Plate IV.).—This mine, which is situated about 1½ miles due north of Cue has been continuously worked for a number of years, the first crushing having been taken out prior to 1897. In 1898 and 1899 it became the property of the company called the Agamemnon, Ltd., who worked it in conjunction with two other mines bulking the results, therefore it is impossible to arrive at an estimate of the value and quantity of the stone raised.

During the following year it fell into the hands of a party of working miners who raised all the payable stone visible above the water level, and rendered all the upper level quite unsafe ; it has now fortunately passed into the hands of a company who have erected a thoroughly up-to-date plant, and are pushing on with the developments by sinking the main vertical shaft, and driving below the water level.

The reef is a well defined body at the surface, having a north-easterly strike with a dip to the south-westward of from 62 to 72 degrees, it presents a bold outcrop for a distance of 17 chains, and can be traced still farther southward by strewn quartz, but at the north end, just beyond the workings, it suddenly plunges beneath an alluvial flat to reappear no more.

Like so many reefs in this district it is associated with a diorite dyke, which, although carrying no value in the oxidised zone, is called formation. This dyke mass is often of considerable width, whilst in places, as above the 150 feet level it pinches, and the quartz veins which here lie upon either side of it are brought almost into contact.

The richest stone occurs in a well defined shoot which has a northerly dip, this, from the surface down to the 50 foot level appears to have been confined to a quartz body upon the footwall of the dyke, but below the 150 foot level this ore body appears to die out, whilst the hanging wall body increases in size and value.

The quartz is of a brownish colour in the upper levels but is blue and contains a considerable quantity of pyrites below the water. The whole formation is enclosed by well-defined striated walls, the shoot dipping at an angle of 63 degrees to the northward upon the lode plane, being 170 feet in width both at the surface and the 200 feet level. The formation consists of chloritic schist in the oxidised zone but below that it is a solid fine grained diorite in a grano-diorite country.

The water in this mine is salt, and at the present time is making at the rate of 12,000 gallons per diem.

The main vertical shaft has been sunk to a depth of 250 feet, passing through the reef at the 200 feet level. This shaft is connected with a reef at the 50 feet level by a crosscut 70 feet in length from which point a drive has been carried north 140 feet and south 120 feet, at the 100 feet below the surface a crosscut has been driven 43 feet east to the No. 2 level, which is in 85 feet south and 160 feet north, at a depth of 150 feet a crosscut 12½ feet east connects the shaft with the No. 3 level, where the reef has been driven on for a length of 45 feet north and 120 feet south. At the present time only portions of these levels are accessible and no record exists of the general character of the lode except that it varied from 2 to 6 feet in width.

At a point just below the intersection of the reef by the shaft it has been driven upon for a distance of 100 feet south and 340 feet north. In the south drive the reef carries no values since the shaft cut it at the southern extremity of the shoot. In the north drive the shoot is 170 feet in length whilst the formation between the walls as proved by several crosscuts varies from 12 to 39 feet; this carries no stone north of the shoot.

The reef has now been crosscut west at the 250 feet level and driven upon in a northerly direction for a considerable distance without encountering the continuation of the shoot which later on was found to die out just below the 200 feet level. This level has now been extended to the southward where a new make of stone has been met with below it by winzing.

Table showing the Yield of the Salisbury Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
Prior to 1897	Salisbury G.M.L. 1046	138·00	158·38	1·22
1897 ...	Do. do.	459·50	798·21	1·74
1898 ...	(Under Agamemnon, late) ...	...	...	...
1899 ...	Do. do. ...	..	...	...
1900 ...	Do. do. ...	172·00	86·82	1·73
1901 ...	Do. do. ...	290·00	81·41	·28
1902 ...	Do. do. ...	1,403·00	936·17	·66
1903 ...	Do. do. ...	22·00	9·97	·45
1903 ...	Salisbury G.M.L. 1374	104·00	55·30	·53
1904 ...	Do. do.	475·00	269·34	·56
1905 ...	Do. do.	1,200·00	1,037·31	·86
1906 ...	Do. do.	3,079·00	2,044·36	·66
	Total	7,342·50	5,477·27	·74

It is pleasing to note that the 1,200 tons last crushed, which was stoped from between the 150 and 200 feet level, yielded a better result than any of the crushings since the outcrop stone was treated.

Lady Florence, late Lady Mary, G.M.L. 1265. (Plate V.)—This mine was worked upon a parallel line of reef about seven chains due west of the Cue One (q.v.).

It is a double lode, one sheet of quartz lying upon either wall of a weathered basic dyke having a total width between the walls of 10 feet, dipping at an angle of 39 degrees to the westward.

A main underlay shaft has been sunk upon the formation to a depth of 216 feet measured upon the incline, or 135 feet vertical, this being the water level. At this level the lode has been driven on for a distance of 200 feet north, the first 100 feet from the shaft being stoped up to the No. 1 level, whilst to the south the level has been driven 100 feet, 80 feet of which has been stoped up.

Below this level from the bottom of the main underlay a winze has been carried down for a depth of 80 feet, and three other small winzes have also been sunk from it.

The No. 1 level, which is 145 feet upon the incline and 70 feet vertically below the surface, has been driven 225 feet north, the stone from above being mostly stoped, whilst to the southward it was extended 130 feet, 70 feet of which has been stoped.

The continuation of this lode to the dip was cut in the new main shaft at a vertical depth of 230 feet which proves that the body is continuous and of an uniform dip, unfortunately at the point of intersection it was of no value. This mine has been closed down for several years but is held as a block claim to the Cue No. 1, the new main shaft of which is upon this lease.

Upon the southern end of this lode, which was formerly called the **Lady Mary** No. 1 South, a shaft has been sunk to a depth of 94 feet upon the underlay in which the formation between the walls measured 27 feet but of this only 18 inches was quartz.

Table showing the Yield of the Lady Mary Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton	Total.		Average rate per ton.
					Ore crushed.	Gold therefrom.	
		tons.	ozs.	ozs.	tons.	ozs.	ozs.
1896	Lady Mary Amalgamated G.M.L. 674 and 60*	2,099·00	2,095·53	·99			
1897	Lady Mary Amalgamated G.M.L. 674*	1,014·00	853·42	·84			
1898	Do do 674*	...	220 57	...	3,151·00	3,189·25	1·01
1900	Do do 1222	38 00	19·73	·52	38 00	19·73	·52
1896	Lady Mary No. 1 South G.M.L. 157	147·00	238·75	1·62			
1897	Do do 157	121·00	197·56	1·63			
1898	Do do 157	30·00	44·56	1·48			
1899	Do do 157	121·00	317·18	2·62			
1900	Do do 157	16·50	16·01	·94	435·50	814·06	1·87
	Total	...	...	...	**3.624·50**	**4.023·04**	**1·11**

*Includes the Rising Sun, G.M.L. 60.

Cue No. 1, *G.M.L.* 203. (Plate V.)—This was one of the earliest gold-bearing reefs discovered in this district, it having been taken up by Messrs. Pead and Edwards in the early part of the year 1892; it subsequently passed into the hands of the Cue consolidated Gold Mine, Ltd., by whom it was worked in conjunction with several other leases until the year 1900, when at the winding up of the company it was purchased by Messrs. Chesson and Hayden, the present owners.

There is a plant consisting of 20 head of stamps, 8 leaching and 3 storage vats, two winding engines with the necessary boiler power and pumps; this battery is at present being used as a public crushing plant whilst developments are being carried on upon the mine.

The reef has a general strike of nearly north and south with an underlay of 37 degrees to the westward it had a continuous outcrop of 300 feet south from the northern boundary of the lease beyond which point it is lost, a blow of quartz however occurs just outside the south boundary upon the same line which is in all probability within the same fissure.

The country rock is grano-diorite whilst the fissure contains both a quartz reef and a diorite dyke, the latter being weathered into a magnesian clay near the surface where it forms the hanging wall of the lode and is called formation, although of no value.

This same dyke is met with at the bottom of the new vertical shaft, which was examined by Mr. Talbot, Field Assistant, in June, 1906, who reports:—"At the shaft bottom the country rock is granite but a few feet from it the crosscut enters what is called the 'formation' and continues to pass through it for a distance of 20 feet when the granite is again seen. This is not the true thickness of the formation as at this point it is very flat. The so-called formation appears to me to be simply a diorite dyke that has been intruded along the same line of fracture as the quartz reef."

The reef fissure is one of the radiating series situated near the contact zone of the grano-diorites with the amphibolites probably resulting from the contraction of the former upon cooling. This fissure will probably prove to be of very considerable vertical extent since it is traversed by an intrusive dyke but it would be premature to express an opinion with regard to the behaviour of the included quartz body or its zones of value until more work has been done at the 530 foot level, particularly as the lower workings in the old mine are not open to inspection.

The mine being inaccessible owing to the water having been allowed to accumulate, the old workings below the No. 2 level could not be inspected whilst in those above this level nothing could be seen but stoped out ground, most of which was unsafe, the plan of the workings as supplied by the old company has been taken as a basis for the description of the work done, whilst the dotted portions have been added from information supplied by the present owners who have had no survey made.

A considerable amount of development has been done upon this mine, which was originally worked to the No. 2 level by an underlay shaft, then a vertical shaft was sunk to a depth of 270 feet intersecting the reef at about 162 feet from the surface, the Nos. 2 and 4 levels were connected by a winze, being the continuation of the main underlay shaft and another winze was sunk below the No. 4 level for a distance of 104 feet upon the dip of the reef.

The No. 1 level, which is at a vertical depth of 87 feet from the surface, is connected with the vertical shaft by a crosscut 87 feet in length from which it has been driven 250 feet north from 170 feet of which the reef has been stoped out, beyond which it was broken and valueless, whilst south it was continued for a distance of 230 feet in good stone all the way, the stoping being carried on for a distance of 70 feet beyond the end of the level.

The No. 2 level is 129 feet from the surface and is connected with the shaft by a crosscut 41 feet in length; it has been driven for a distance of 250 feet north, the last 50 feet being in valueless country whilst the balance has been stoped. This level has been extended south for a distance of 500 feet from the whole of which length the stone has been stoped.

The No. 3 level is at a vertical depth of 178 feet from the surface and is connected with the main shaft by a crosscut 10 feet in length; it has been driven for a distance of 270 feet north but in this no stone of sufficient value to pay for crushing was met with, whilst in the south drive, which is 500 feet in length, the reef proved to be payable throughout.

From this level a crosscut has been driven west for a distance of 350 feet beneath the Lady Mary Reef, if this had been continued another 70 feet the winze in that mine would have been cut.

The No. 4 level is connected with the main shaft by a crosscut 132 feet in length, and has been driven 130 feet north in barren ground whilst in the south level, which is 300 feet in length, the first 120 feet proved to be barren, the next 130 feet of sufficient value to stope up to the No. 3, and the last 50 feet barren.

Below this level only a small quantity of ore has been stoped. The stoped portions as seen upon the section create the impression that a fairly well-defined shoot of payable stone having a southerly dip has been worked out; if this is the case the shoot in this mine behaves in an entirely different manner to the other lodes upon this field, in which the shoots of the reef having a northerly course invariably dip in that direction.

It is quite impossible to form a decided opinion with regard to this reef, as the workings are inaccessible, but it is quite possible that instead of one shoot dipping to the southward there may be two short ones dipping to the northward and this theory is in a measure borne out by the fact that the old company worked the northern portion down to the No. 2 level, where the lode lost its values, whilst later on the present owners found an equal sized patch of payable stone further to the southward in the Nos. 2, 3, and levels, below which it also lost its values; this latter may have bee upon the other side of the formation, as in the Salisbury.

It is clear that a continuous shoot does not exist in this mine but the rich stone may occur (as it often does in other country) as a series of lenticular masses of considerable extent, which although not connected follow a general direction, and if this should be the case in this instance it is quite possible that more of these may be met with on the dip of the lode.

A new main vertical shaft has been sunk at a point 750 feet west of the main underlay shaft, this cut the Lady Mary reef at a depth of 230 feet but it was broken and of little value, it was then carried down to a depth of 549 feet with Government assistance. at which depth the Cue No. 1 reef was cut.

After leaving a 20 foot sump a crosscut was driven 36 feet east, the reef here consists of small quartz veins in a crushed dyke rock. Samples taken at the crosscut yielded no gold, whilst one taken 98 feet from it gave gold at the rate of 7dwts. 10 grains to the ton, whilst one at 90 feet only yielded a trace.

This is so far satisfactory, as proving that the reef still carries gold at this level, and therefore the Government has continued the subsidy in order to prove whether any payable stone exists at this depth.

It is quite impossible to arrive at a correct estimate of the quantity of stone crushed from this mine owing to the fact that prior to 1898 it was worked in conjunction with the Princess Ada, whilst during 1898 and 1899 the returns included the crushings from the Cue No. 1, Princess Ada, Rising Sun, and Light of Asia.

Table showing the Yield of the Cue No. 1. Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
Prior to 1897	*Cue No. 1 G.M.L. 202 ...	3,815·00	3,984·55	1·04
1897	* Do. do. ...	6,688·00	4,496·62	·67
1898	† Do. do. ...	6,652·00	4,130·25	·62
1899	‡ Do. do. ...	650·00	1,387·16	2·13
1900	Do. do. ...	434·50	487·45	1·12
1901	Do. do. ...	283·00	117·44	·41
1902	Do. do. ...	4,203·00	4,755·82	1·13
1903	Do. do. ...	1,812·50	3,689·80	2·03
1904	Do. do. ...	541·50	2,287·07	4·22
1905	Do. do. ...	703·00	1,092·46	1·55
1906	Do. do. ...	47·00	67·37	1·43
	Total	25,829·50	26,495·99	1·02

* Including Princess Ada and Light of Asia.

† Including Princess Ada, Lady Mary, Rising Sun.

‡ Including Lady Mary and Rising Sun.

Rising Sun, G.M.L. 1248. (Plate V.).—This old mine is upon what is apparently the northern extension of the Cue No. 1 fissure, but the quartz body does not appear to be continuous. It was discovered as far back as 1892 by Mr. Prendergast, but later on passed into the hands of the Lady May Amalgamated, then the Cue Consolidated, and later still into those of the present owners, Messrs. Chesson and Hayden.

It was originally equipped with a crushing and winding plant, but these have long since been removed and the workings allowed to fall in as it is now only held for area purposes.

The reef outcropped for a length of 480 feet, the northern 300 feet of which has been stoped to the surface, a particularly rich portion being met with at the junction of a spur reef which runs away to the eastward.

The plan of this old mine shows that the lode was followed down upon the underlay for a distance of 280 feet, levels being set off at the 200 and 140 feet, the former of these is 170 feet in length and the latter 270 feet, all the stopes being apparently between this level and the surface.

Between the south end of the outcrop of this reef and that worked in the Cue No.1 there is a break of about 120 feet where no stone shows at the surface, this was also driven into in the Nos. 1 and 2 from the latter mine, where formation with only a little stone was met with.

Prior to the year 1900, this mine was worked by a company called the Lady Mary Amalgamated, the returns being bulked with those from that mine.

Table showing the Yield of the Rising Sun Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1900	Rising Sun G.M.L. 1248	80 00	42·40	·53
1901	Do. do.	871·00	660·91	·75
1902	Do. do.	247·00	135·31	·54
	Total	**1,198·00**	**838·62**	**·70**

Rising Sun North, G.M.Ls. 1262, 1500.—Immediately to the northward of the Lady Mary and the Rising Sun are two leases which both bear the same name, G.M.L. 1262 being to the north of the latter and was worked in the year 1901, when 56 tons o stone raised yielded 36.03ozs. of fine gold, whilst G.M.L. 1500 wa worked in the year 1905 upon a block north of the Lady Mary which yielded 15 tons of stone which returned 1.08ozs. of gold.

Success, late Caledonian Hill, G.M.L. 1504.—This lease is situated at the north-east corner of the Cue township by the railway line at the base of the Cue Hill.

It is at the south end of the large dryblowing patch, and from the surface of this lease a considerable quantity of gold is said to have been obtained.

It was originally taken up by Dr. Monteith (as the Caledonian Hill Sluicing Co.) with the object of sluicing the surface, but since the fall of the surface was into the main street of the town, this project was abandoned and the reefs worked instead.

In the year 1901 the property was abandoned, after which the town council used the main shaft as a well, but since a new water supply has been obtained this lease has again been taken up as the Success.

The main reef upon this lease is large and well defined, running upon a north-easterly course with a dip of from 70 to 75 degrees to the westward. The quartz is very ferruginous, and in places consists very largely of oxide of iron ; however, the gold contents are as a rule very low, with here and there small but rich patches.

The country rock enclosing the reef is amphibolite schist, but the grano-diorite being met with from 250 to 300 feet to the westward, therefore this reef may be said to be within the contact zone. Between the reef and the granite there is a porphyritic dyke which dips at a low angle to the eastward, passing through the reef but causing no displacement [**6892-3**].

The whole of the western portion of the lease is strewn with quartz, which has been worked over several times by the dryblowers, but in spite of the fact that numerous reefs outcrop, the gold can in no case be traced to them, it is therefore quite probable that the superficial deposit was derived from southerly extension of one of the flat reefs which exist to the northward ; the scattered fragments of quartz and gold being all that remain of it.

A number of shafts have been sunk along the reef outcrop to various depths, and from these small parcels of stone have been crushed, but since only 100 tons of stone were treated during the five years that the property was worked by the Company, it must be assumed that payable stone only occurred in very limited quantities.

A main shaft was sunk to a depth of 190ft., but since a very heavy water supply was cut, a crosscut was driven above it in an easterly direction for a distance of 60 feet to the reef at the 140ft. level. From this crosscut the reef has been driven on for a distance of 140ft. north and 10ft. south, connection being made with the old No. 2 shaft. which is 30ft. vertical and 130ft. on the underlay, at a distance of 105ft. from the crosscut.

The drive has been extended 35 feet north of the No. 2 shaft, the object of the prospectors being to carry it on another 120 feet to a point beneath an old 90ft. shaft (No. 1) from which some rich stone is said to have been taken.

The stone in this level has been consistently of no value, with the exception of a small patch 69 feet north of the crosscut, where a small rich bunch was cut, from which 24½ tons of stone were raised and crushed, which yielded 22.92 ounces of fine gold.

Most of the development work done by the original company is upon the south end of the reef, also the main shaft is located in that quarter, this apparently indicates that the then manager was of the opinion that the greatest values would be met with there. This is supported by one of the present owners who worked in the mine at the time, who states that some of the best crushings came from the south end.

Table showing the Yield of the Caledonian Hill Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1897	Caledonian Hill G.M.L. 1068	...	36·58	
1898	Do. do. do.	5·00	8·71	1·74
1899	Do. do. do.	42·00	36·27	·46
1900	Do. do. do.	18·00	5·47	·30
1901	Do. do. do.	35·00	14·13	·40
1906	Success G.M.L. 1504	24·50	22·92	·93
	Total	**124·50**	**124·08**	**1·00**

The West Australian, G.M.L. 1172.—This lease, which was formerly known as the Princess Ada South, is situated between the Princess Ada and the Cue No. 1, and upon it a considerable quantity of work has been done upon a north-west reef which underlays to the eastward.

A vertical shaft was sunk to a depth of 220 feet with the object of cutting the Princess lode, but this was unsuccessful.

There are only records of two crushings from this mine, one being taken out in 1897, under the name of the Princess Ada South, G.M.L. 1059, and the other under that of the West Australian, G.M.L. 1172, in 1901, which totalled 164 tons of stone yielding 18.12 ounces of fine gold.

Princess Ada, G.M.L. 1433, 1481 (Plate VI.).—This property is situated a little northward of the Cue township boundary, and from its surface in the early days of this field a very considerable quantity of gold has been won by the dryblowers.

The reef itself averages about 2 feet 6 inches in thickness, having a well defined outcrop running a little north of east for a length of 17 chains, with a dip of about 33 degrees to the southward.

It was first worked by the prospectors, then by Messrs. Bewick, Moreing, and Co., in conjunction with the Cue No. 1 for two years, during which time the shoot of stone was stoped up from the water level (150 feet) to the 60 feet level. Upon their abandoning it the original prospectors again took it up and stoped the balance of the stone to the surface, they also put down a main vertical shaft to the water level, and followed the reef down for a further distance of 80 feet on the underlay.

A new vertical main shaft has now been sunk southward of the old workings to a depth of 250 feet, from which a crosscut was driven north for a distance of 200 feet to the winze in the old workings. The country passed through in this shaft was foliated granite to the water level, below which the massive grano-diorite was encountered, the reef being accompanied on either side by a formation consisting of a weathered schistose rock containing a considerable quantity of mica. In this shaft a good supply of fresh water was cut, which yielded 15,000 gallons in the 24 hours. Between the main shaft and the old workings there is a cross reef which strikes in a north-westerly direction, dipping to the north-east, upon which a considerable amount of shallow work has been recently carried on with very good results, but this reef has not yet been traced down to its junction with the Ada reef.

No returns appear from this mine until it was worked with the Cue No. 1, and then it is included in the yield from that mine, therefore it is impossible to arrive at a correct estimate of its production.

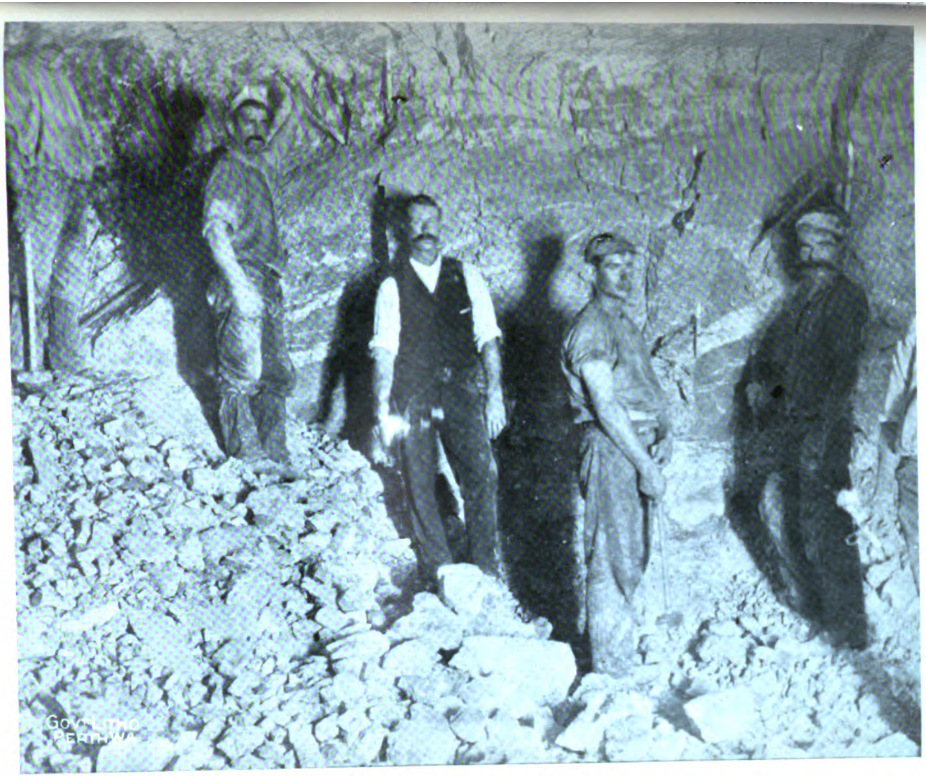

Photo., H. P. Woodward. The Reef in the Volunteer South Extended.

Table showing the Yield of the Princess Ada Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1899	Princess leases G.M.L. 1150 and 1178...	446·00	407·46	·90
1900	Do. do. 1150 and 1178...	490·00	542·55	1·10
1901	Do. do. 1150 and 1178...	306·00	190·19	·62
1902	Do. do. 1150 and 1178...	10·00	4·24	·42
1903	Do. do. 1150 and 1178...	487·00	200·36	·41
1904	Do. do. 1150 and 1178...	51·00	10·16	·19
1905	Princess Ada G.M.L. 1433	225·00	113·66	·50
1906	Do. do. 1433	1,552·00	563·67	·36
1906	Old Princess Ada G.M.L. 1488 ...	889·00	428·18	·48
	Total	**4,456·00**	**2,460·47**	**·55**

The tailings from the early crushings were later on purchased and treated with cyanide when they gave an extract of 3½dwts. per ton of sands.

The Volunteer Group.—This group of leases is upon what is known as "The Patch," which is a large dryblowing area from which a very considerable quantity of gold was won in the early days of this field, situated to the northward of the town, and between it and Table Top Hill.

The reefs of this group occur as more or less horizontal sheets, some of which do not outcrop but were discovered in sinking, in some instances one overlaying another, so far, however, no prospecting has been carried on in the solid country which comes in at a depth of 120 feet.

The country above this level is for the most part kaolinised granite, which is so soft that it can be bored with an auger, but in some places portions of the rock still remain solid and unaltered in which the reefs have not generally proved to be rich. [**3810**].

The footwalls, or floors, of the quartz bodies present a rolling character, the angle of inclination of which rarely reaches, and never exceeds, 17 degrees ; on the other hand, however, the hanging wall or roof varies very considerably from it, being most irregular, rising in places until the reef assumes a thickness of as much as 13 feet (see Photograph Nos. 9 and 10), then suddenly closing down and reducing the size of the vein to 18 inches or 2 feet.

Before this erratic character was understood a shaft was sunk in order to test a large reef being worked in an adjoining lease, but striking a small low value vein it was abandoned. Later on, however, when the workings were extended from another point in this direction, it was discovered that the shaft had been sunk through a pinched portion of the reef only a few feet from a fine body of stone.

Although not of high grade, the cheapness with which these large bodies of stone can be worked has rendered them very profitable for some time past whilst the total production, which amounts to 21,435 ounces of fine gold, has added very materially to the prosperity of the town.

Table showing the Yield of the Volunteer Group of Reefs.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.	Total. Ore crushed.	Total. Gold therefrom.	Average Rate per ton.
		tons.	ozs.	ozs.	tons.	ozs.	ozs.
1900	Comforter G.M.L. 1234	29·00	12·00	·41			
1902	Do do	64·00	29·19	·45	93·08	41·19	·44
1896	Conscript G.M.L. 1067	12·00	9·96	·83			
1897	Golden Garter G.M.L. 1111	72·00	44·71	·62			
1898	Do do	412·00	171·86	·41			
1899	Do do	136·00	8·93	·06	620·00	225·50	·36
1903	New Volunteer Extended G.M.L. 1259	229·00	154·19	·67	229·00	154·19	·67
1896	Volunteer G.M.L. 1070	108·00	143·00	1·32			
1897	Do do	54·00	32·93	·60			
1898	Do do	37·50	36·85	·98	199·50	212·78	1·06
1898	New Volunteer G.M.L. 1135	463·00	191·92	·41			
1899	Do do	302·00	262·55	·86			
1900	Do do	474·00	502·70	1·06			
1901	Do do	698·00	772·59	1·10			
1902	Do do	1,434·00	1,302·23	·90			
1903	Do do	347·00	132·75	·38			
1904	Do do	512·00	255·12	·49			
1905	Do do	200·00	225·00	1·12			
1906	Do do	129·00	39·56	·30			
					4,559·00	3,684·52	·80

1903	Volunteer North G.M.L. 1350	40·00	10·06	·25			
1904	Do do	65·00	13·70	·30			
1905	Do do	16·50	5·97	·36	121·50	29·73	·24
1902	Volunteer Deeps G.M.L. 1323	20·00	2·01	·10	20·00	2·01	·10
1899	New Venture G.M.L. 1161	24·00	4·73	·19	24·00	4·73	·19
1899	Struggle G.M.L. 1153	35·00	5·93	·17			
1900	Do	90·00	25·36	·28	125·00	31·29	·25
1896	South Volunteer G.M.L. 1044	50·00	27·15	·54			
1897	Do do	76·00	45·78	·60			
1901	Do do	61·00	33·41	·54			
1902	Do do	415·00	198·41	·47			
1903	Do do	3,634·00	1,951·74	·53			
1904	Do do	1,134·00	444·57	·39			
1905	Do do	235·00	105·78	·45	5,479·00	2,733·85	·49
1899	Volunteer South Extended G.M.L. 1145	430·00	297·84	·69			
1900	Do do	1,105·00	910·83	·82			
1901	Do do	1,465·00	1,544·19	1·05			
1902	Do do	3,135·50	2,192·61	·67			
1903	Do do	5,246·00	2,669·50	·50			
1904	Do do	3,062·00	1,111·58	·36			
1905	Do do	1,840·50	769·75	·41			
1906	Do do	3,784·00	1,332·80	·35	20,068·00	10,829·10	·54
1896	Twilight G.M.L. 774	110·00	124·90	1·13			
1897	Do do	138·00	175·47	1·27			
1898	Do do	227·00	270·32	1·14			
1899	Do do	423·00	419·74	·99			
1900	Do do	388·00	305·78	·78			
1901	Do do	342·00	198·85	·58			

Table showing the Yield of the Volunteer Group of Reefs—continued.

Year.	Name and Number of Lease:	Ore crushed.	Gold therefrom.	Rate per ton.	Total. Ore crushed.	Total. Gold therefrom.	Average Rate per ton.
		tons.	ozs.	ozs.	tons.	ozs.	ozs.
1902	Twilight G.M.L. 774	45·00	15·96	·35			
1903	Do do	568·00	203·14	·34			
1904	Do do	116·00	93·09	·79	2,357·50	1,807·25	·79
1904	Twilight South G.M.L. 1090	252·00	180·56	·71			
1905	Do do	89·00	24·79	·27	341·00	205·35	·60
1902	Starlight G.M.L. 1325	105·00	84·79	·80			
1903	Do do	548·00	573·63	1·04			
1904	Do do	358·00	390·80	1·09			
1905	Do do	262·00	285·14	1·08			
1906	Do do	233·50	139·04	·59	1,506·50	1,473·40	·97
	Total	...	...	...	**35,743·00**	**21,435·09**	**·60**

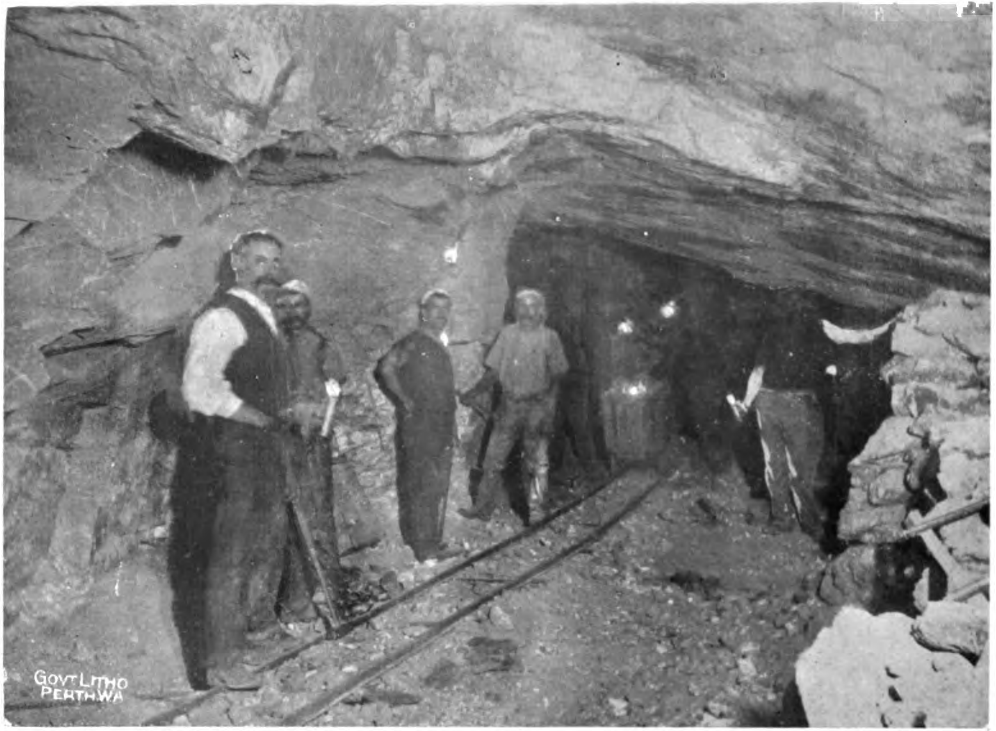

Photo , H. P. Woodward.

The Reef in the Volunteer South Extended.

The Countess, G.M.L. 1066.—This lease is situated upon the northern side of Table Top Hill, about one mile north of Cue.

The country is kaolinised grano-diorite down to the water level, below which it is extremely hard and contains segregations of finer-grained grano-diorite [**6883-6**].

There are two or three small quartz reefs upon this lease which strike in a north-westerly direction and underlay southerly at a low angle, most work having been done upon the northernmost of these.

Some few years ago an attempt was made, with Government assistance, to cut the dip of the Arcadia reef, which is a north-west reef in the adjoining property to the north. It is from 4 to 7 feet in thickness, and has an outcrop of about 20 chains, and yielded a considerable quantity of rich stone.

The shaft had been sunk to a depth of 290 feet by a local company when they obtained a subsidy to help them to carry it on for another 100 feet; however, for some reason it was abandoned when a depth of 316 feet had been reached, the only indication of a formation was cut at a depth of 260 feet, but this was of little value.

The Countess Extended, G.M.L. 1386.—This lease lies between the last-mentioned and the Table Top Hill, and upon it a number of flat reefs of a similar character in every way to the Volunteer group have been worked.

Table showing the Yield of the Countess Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton
		tons.	ozs.	ozs.
1898	Countess G.M.L. 1066	157·50	204·53	1·29
1899	Do. do. 1066	250·50	151·60	·60
1900	Do. do. 1212	10·00	7·76	·77
1901	Do. do. 1212 and 1230 ...	61·00	49·17	·80
1902	Do. do. 1212 and 1230 ...	103·00	30·51	·29
1904	Heart of Oak G.M.L. 1427	129·00	73·11	·56
1904	Countess Extended G.M.L. 1386 ...	550·00	186·79	·34
1905	Do. do. do. 1386 ...	1,148·00	685·79	·56
1906	Do. do. do. 1386 ...	728·00	421·95	·58
	Total	**3,137·00**	**1,811·21**	**·57**

Arcadia Reef.—This reef, which strikes in a north-westerly direction and dips at a low angle to the southward, lies to the northward of the Countess, and has been opened up from the railway line for a distance of 40 chains.

The lode varies considerably in size, being in places as much as 7 feet across, and upon it a considerable quantity of work has been done, mostly of a shallow character, the greatest depth worked upon the main shoot being 150 feet upon the underlay.

This shoot was prospected for by the main vertical shaft in the Countess, but since the shaft was at least 5 chains to the south-eastward of where it might have been expected it was not cut.

It has been worked since the early days of the field up to 1905, the reef line being pegged and re-pegged no fewer than eight times.

Table showing the yield of the Arcadia Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.	TOTAL. Ore crushed.	TOTAL. Gold therefrom.	Average Rate per ton.
		tons.	ozs.	ozs.	tons.	ozs.	ozs.
1896	Arcadia G.M.L. 640	565·00	626·30	1·10			
1897	Do	691·00	371·29	·54			
1898	Do	351·50	285·03	·81			
1899	Do	601·00	242·78	·40			
1900	Do	65·00	31·18	·48			
1901	Do	122·00	45·47	·37	2,395·50	1,602·05	·67
1902	New Arcadia G.M.L. 1311	197·00	65·37	·33			
1903	Do	190·50	207·61	1·09			
1904	Do	204·50	91·62	·44	591·00	364·60	·61
1896	Ashbourne G.M.L. 750	501·00	440·52	·87			
1897	Do	168·00	50·91	·30	669·00	491·43	·73
1900	Arcadia North G.M.L. 1179	17·50	2·26	·13			
1901	Do 1247	6·00	1·14	·19	23·50	3·40	·14
1903	Bedford G.M.L. 1366	10·00	303·63	30·36	10·00	303·63	30·36
1905	New Arcadia North G.M.L. 1355	100·00	34·94	·34	100·00	34·94	·34
1905	New Arcadia North Extended G.M.L. 1453	58·50	33·81	·57	58·50	38·81	·57
	Total	...	...	...	3,847·50	2,833·86	·73

PHOTO. 11.

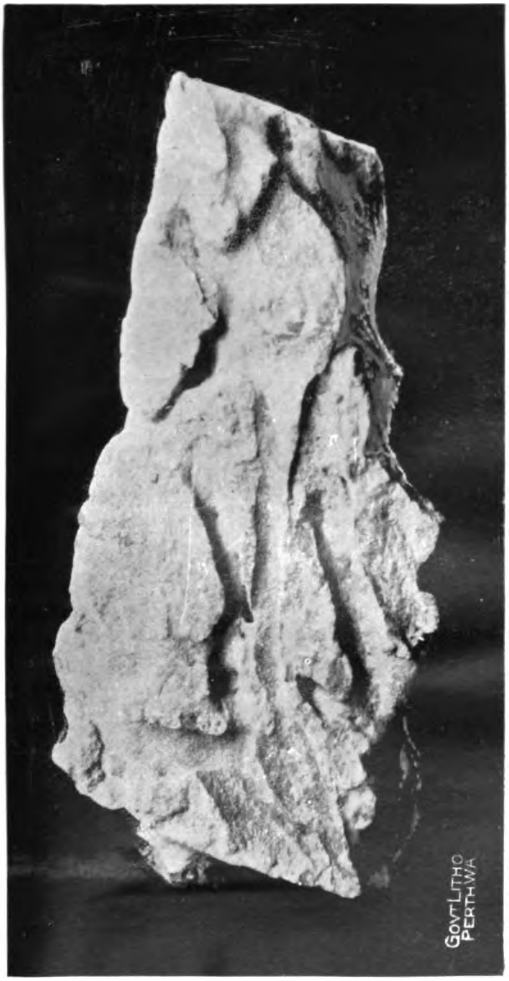

Photo., R. H. Irwin.

A specimen of Worm-bored Rock.

The Cue Victory, G.M.L. 1174. (Plate VII.).—This mine is crossed by the Cue-Nannine railway line about one mile north of the town.

Upon it there are two reefs, the main one, which was formerly known as the Golden Stream, has a general north-easterly course with a dip to the north-westward of 21 degrees, but towards the south end it sweeps round on to a more southerly course after it has joined with the Commonwealth lode, from which point it follows this direction, dipping to the westward under the railway line.

Upon the Golden Stream reef a main underlay shaft has been sunk, which measures 480 feet upon the incline, although the lowest point is only 170 feet below the surface, the water level being 150 feet in vertical depth.

From this shaft four levels have been driven to the southward, No. 1 has fallen in, so that no survey could be made; No. 2 is about 350 feet in length, and in it payable stone was cut at a distance of 100 feet south of the shaft, the whole body of which has been stoped out for a length of 210 feet between this level and the surface. No. 3 level has been driven for a distance of 350 feet, the first 120 feet of which was in barren ground, beyond which the whole of the shoot was stoped for a distance of 220 feet in a solid block up to the No. 2 level. No. 4 level was driven for a distance of 350 feet, the first 170 feet of which was in valueless country, beyond which the lode has been stoped for a distance of 160 feet up to the No. 3 level, whilst below it for a distance on the incline of 40 feet the stone has been underhand stoped.

At the end of this level there is a whip shaft 137 feet in depth, from which the lower portion of the mine is worked.

The reef has been worked at the surface for a length of 200 feet southward from a quartz blow, upon which the battery is situated, to an opencut in which the junction of this reef with the Commonwealth is visible.

The reef varies from a few inches to 5 feet in thickness, averaging about 2 feet, the country being soft kaolinised grano-diorite, often worm-bored. (Photo. No. 11.)

The Commonwealth reef, which is about 15 inches in thickness, splits off from the Golden Stream in the open cut upon a northerly course, dipping at a very low angle to the westward. It follows a very much altered basic dyke, which is called formation, and is from 4 to 20 feet in thickness lying below the reef, whilst its roof is weathered grano-diorite.

This reef has been followed down upon the underlay for a distance of over 200 feet, portions of the reef having been entirely stoped out, but owing to the fact that the dip is so slight, further work has been prohibited as it would render the railway line unsafe.

There is a ten-head battery upon this lease, with four 40-ton cyanide vats, this plant being mostly used for public crushings.

Table showing the Yield of the Golden Stream and Commonwealth Reefs.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1896	Cue Victory G.M.Ls. 201–208	448·00	612·00	1·36
1897	Do. do. do.	2,818·00	1,820·30	·64
1898	Do. do. do.	3,057·50	1,370·42	·44
1899	Do. do. do.	204·50	55·62	·27
1900	Do. do. do.	...	...	...
1901	Do. do. do.	...	...	...
1902	Do. do. do.	*18·00	1,172·40	...
1903	Do. do. 1174	268·00	713·95	2·66
1904	Do. do. do.	244·00	505·13	2·07
1905	Do. do. do.	214·00	568·47	2·60
1906	Do. do. do.	882·00	538·76	·61
	Total	8,154·00	7,357·09	·90

* Cyaniding sands.

Golden Stream Extended and Republic.—Passing through these two leases is a reef having a north-easterly course with a dip of about 30 degrees to the north-west, which has often been supposed to be the eastern continuation of the Golden Stream reef. This, however, is not the case, as there is absolutely no connection between them, although it is quite possible that the individual quartz bodies may tenant the same line of fissure.

The shoot of stone in this reef is about 90 feet in length and about 4 feet in thickness, and it has been practically worked out to the water level, which is 150 feet in vertical depth from the surface, below which the reef carries little value and is much smaller.

Table showing the Yield of the Golden Stream Extended Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.	Total. Ore crushed.	Total. Gold therefrom.	Average Rate per ton.
		tons.	ozs.	ozs.	tons.	ozs.	ozs.
Prior to 1897	Golden Stream Extended G.M.L. 711 ...	20·00	18·95	·94			
1897	Do. do do. 711 ...	30·00	65·69	2·18			
1898	Do. do. do. 711 ...	112·00	183·00	1·64			
1899	Do. do. do. 711 ...	135·00	179·65	1·33			
1900	Do. do. do. 711 ...	830·00	937·08	1·12			
1901	Do. do. do. 711 ...	1,215·00	932·46	·76			
1902	Do. do. do. 711 ...	105·00	46·62	·44	2,447·00	2,362·45	·96
1903	Do. do. do. 1359 ...	274·00	112·94	·41			
1904	Do. do. do. 1359 ...	96·00	99·31	1·03			
1906	Do. do. do. 1359 ...	468·00	164·18	·35	1,038·00	566·16	·54
1899	Republic G.M.L. 673	114·00	81·83	·71	114·00	81·83	·71
1904	Golden Stream Extended North G.M.L. 1416	85·00	25·78	·30			
1905	Do. do.	12·00	6·50	·54	97·00	32·28	·33
	Total	...	...	...	3,696·00	3,042·72	·82

The Mystery, late Lady Hynes, G.M.L. 1296 (abandoned).—This old lease is situated upon the northern side of the Cue trig., and a little to the south-east of the quarry. There are two reefs, one of which strikes north-east and the other a little east of north with an underlay to the eastward.

Upon the westernmost of these several shafts have been sunk in a schistose amphibolite, most work having apparently been done at the south end where the reefs coalesce.

Table showing the Yield of the Lady Hynes Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1899	Lady Hynes G.M.L. 1165 ...	67·00	50·23	·75
1900	Do. do. 1165 ...	89·00	55·73	·62
1900	Mystery do. 1296 ...	...	1·82	...
	Total	**156·00**	**107·88**	**·69**

About half a mile north of the last-mentioned reef are some old workings upon the south-west edge of the "Pearling Ground." The reef strikes in a north-easterly direction, dipping to the north-west at an angle of 50 degrees, the country being schistose amphibolite up to the north end of the lease, where it changes suddenly into grano-diorite.

This area has changed hands no less than seven times since 1897, during which period the total quantity of stone raised was 256 tons.

Table showing the Yield of the New Eldorado Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1897	New Eldorado G.M.L. 1045	25·00	4·57	·18
1898	Do. do.	39·50	176·88	4·50
1899	Golden Crow's Nest G.M.L. 1149 ...	10·00	·79	·07
1900	Nil Desperandum G.M.L. 1210 ...	115·00	23·71	·20
1902	Perseverance G.M.L. 1329	24·00	27·38	1·13
1905	Nil Desperandum G.M.L. 1436 ...	36·00	18·92	·52
1906	Star of Hope G.M.L. 1551	6·00	4·70	·78
	Total	**255·50**	**256·95**	**1·00**

Star of Asia, G.M.L. 958 (abandoned).—This is situated upon a quartz blow to the northward of the last-mentioned, the reef strikes upon the same course but although it may possibly be in the same fissure, the quartz body is not continuous across the contact zone of the amphibolites with the grano-diorites, the last-mentioned forming the country of this reef. Fifty-four tons of stone are reported to have been crushed from this reef which yielded 4.57 ozs. of fine gold.

Gem of Cue Extended, G.M.L. 1020.—This lease which is situated about half a mile to the north-eastward of the Cue Victory, has been worked by a company from the earliest days of this field until 1900, but in 1903 it appears to have passed into the hands of the present owner, Mr. Lloyd, who uses the 10-head stamper mill and cyanide vats upon the treatment of stone raised by him from his other properties; the whole production of this mine from the years 1903 to 1906, less than 20 tons crushed, being gold recovered from the sands. The reef strikes a little north of east with an underlay of about 50 degrees to the northward, it was small being about 14 or 15 inches in thickness, lying between a diorite hanging wall and a grano-diorite footwall, and carried good values down to a vertical depth of 100 feet below which it was small and of low grade.

It was worked by an underlay shaft to a depth of 314 feet on the incline, but a vertical shaft was also sunk to a depth of 187 feet, in which a water supply yielding 1,000 gallons per hour was cut at a depth of 120 feet, no connection was made with the old workings but it was utilised as a water shaft.

Table showing the Yield of the Gem of Cue Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1896	Gem of Cue, late G.M.L. 523, etc. ...	40·00	50·85	1·27
1897	Do. do. ...	20·00	21·89	1·04
1898	Do. do. ...	862·00	555·20	·64
1899	Do. do. ...	4,826·00	2,910·94	·60
1900	Do. do. ...	5,850·00	3,134·24	·53
1903	Gem of Cue Extended, 1020	20·00	706·72	...
1904	Do. do. ...	...	213·59	...
1905	Do. do. ...	...	277·94	...
1906	Do. do. ...	...	307·13	...
	Total	**11,744·00**	**8,250·43**	**·70**

Eclipse, G.M.L. 248.—About 10 chains to the eastward and apparently along the same line of fissure another quartz reef outcrops upon which a considerable quantity of work has been done.

The reef is well defined with a strike a little north of east, and an underlay to the northward at an angle of about 45 degrees, the stone averaging about 2 feet in thickness and it is said to have been going down strong at the bottom where a heavy supply of water was cut.

The shoot appears to be about 5 chains in length at the surface, for which length it has been entirely worked out, whilst the workings have been carried down to the water level which is 100 feet in vertical depth below the surface.

This reef is cut off entirely at the eastern end by a felspar porphyry dyke.

Table showing the Yield of the Eclipse Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton
		tons.	ozs.	ozs.
1896	Eclipse G.M.L. 248	72·00	28·96	·40
1897	Do. do.	206·00	89·09	·43
1898	Do. do.	210·00	118·23	·56
1899	Do. do.	142·00	65·97	·46
1900	New Eclipse G M.L. 1243	30·00	20·53	·68
1901	Do. do.	21·00	6·46	·30
1901	Ophir G.M.L. 1278	31·00	10·20	·33
	Total	**712·00**	**339·44**	**·47**

Light of Asia, G.M.L. 1148. (Plate VIII.)—This mine lies close upon the eastern side of the railway line about 2 miles to the northward of Cue; it was in conjunction with the Queen of the May worked up till the year 1897 by a company called the Light of Asia Amalgamated, after which it was taken over by the Cue Consolidated, and for two years no record appears of the crushings which were bulked with the Cue No. 1. In 1900 it passed into the hands of Mr. Lloyd, who has worked it continuously up to the present.

In the early days there was considerable plant upon this lease, but at the present time most of this has been removed, the stone being carted to the Gem of Cue Battery.

The reef, which is of very considerable size in places, varies from a few inches to a thickness of 14 feet, and has a strike a little west of north with a dip of 45 degrees to the westward.

Two shoots of stone have been worked in this lode, which are about three chains apart, whilst the reef fissure is bounded by grano-diorite on the footwall and felspar porphyry on the hanging wall.

An underlay shaft was sunk by the original company to a depth on the incline of 255 feet, from which levels have been driven at vertical depths of 90, 145, and 200 feet; the No. 1 being in 180 feet south and 200 feet north, the No. 2 being 70 feet north and 50 feet south, the No. 3 105 feet north. In these workings the quartz is of a brownish colour in the upper levels and a bluish grey in the lower, and varies from a few inches to 10 feet in thickness.

Most of the stoping has been done between the No. 1 level and the surface, but a little has also been done between the Nos. 1 and 2 from below which no stone has been raised except in the course of level driving.

The north shoot which is now being worked is a fine solid well-defined body of quartz; contained between two good walls it attains the considerable size of 14 feet in places.

This portion of the lode is worked by a vertical shaft and a horse-whip down to 112 feet (water level), where the shoot is 100 feet wide and 115 feet at the 60 feet level.

Table showing the Yield of the Light of Asia Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1896	Light of Asia G.M.L's. 964 and 1002 ...	942·00	568·37	·60
1897	Do. do. do. ...	1,782·00	846·37	·47
1900	Do. G.M.L 1148	1,247·00	966·07	·77
1901	Do. do.	1,171·00	602·36	·51
1902	Do. do.	1,129·00	655·19	·58
1903	Do. do.	1,374·00	1,291·35	·94
1904	Do. do.	1,707·00	1,391·46	·81
1905	Do. do.	1,855·00	1,392·67	·75
1906	Do. do.	1,355·00	822·26	·60
	Total	**12,562·00**	**8.536·10**	**·67**

Queen of the May, G.M.L. 1151 (Plate IX.).—This reef strikes off from the Light of Asia in a north-easterly direction, with a dip of from 32 to 46 degrees to the northward.

The lode fissure is traversed by a diorite dyke which in the upper levels is represented by a brown greasy clay, but below the water level it is a solid greenstone heavily charged with pyrites. The walls of this fissure are well defined, showing signs of striation, whilst the quartz lies in the form of a sheet between the dyke matter and the wall, one shoot being upon one side and one upon the other, the whole mass from wall to wall measures from 6 to 10 feet, of which about 2 feet are stone.

Although the dyke matter is so highly altered between the water level, which is 110 feet, and the surface, particles of pyrites and copper ore are met with in the reef at the surface in an unoxidised form.

The water makes in the main shaft at the rate of 10,000 gallons in the 24 hours.

It is worked by a main vertical shaft 260 feet deep, with which levels are connected at 255, 207, and 160 feet, whilst the 160, 110, and 60 feet levels are connected with the No. 1 shaft, which was sunk vertically to a little below the 160 feet level. The western shoot lies upon the boundary of the Light of Asia, partly in that property but dipping into it at the lower level. In the No. 1 level there were 100 feet of it in this mine, at the No. 2 80 feet, at the No. 3 50 feet, whilst at the No. 4 it practically ran out below this level. However, should the shoot continue (of which there is every appearance), it will enter the Queen of the May Extended, G.M.L. 1252, belonging to the same owner.

The eastern shoot is separated from the western not only by the dyke, but also by a blank of 130 feet in the No. 1 level, 100 feet in the No. 2 level, and 70 feet in the No. 3 level, whilst the ore body itself is 210 feet in length in the No. 1 level, 170 feet in the No. 2 level, 170 feet in the No. 3 level, and 160 feet in the No. 4 level.

These shoots have a defined dip to the westward, and so far show no diminution in size in depth, whilst the value of the stone has improved.

It is impossible to form a correct estimate of the production of this mine as it was first included in the Light of Asia Amalgamated, and then in the Cue Consolidated up till 1898.

Table showing the Yield of the Queen of the May Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1899	Queen of the May, 1151	208·00	160·05	·76
1900	Do. do.	416·00	413·69	·99
1901	Do. do.	847·00	684·54	·80
1902	Do. do.	741·50	531·11	·71
1903	Do. do.	228·00	166·13	...
1904	Do. do.	517·50	622·65	1·20
1905	Do. do.	1,226·00	1,270·09	1·03
1906	Do. do.	1,037·00	1,377·77	1·33
	Total	5,221·00	5,226·03	1·00

The Winchester and Wallace (abandoned).—These old workings are situated about half a-mile to the north-eastward of the Light of Asia upon a reef which has a north-easterly course and an underlay to the north-west.

From the Winchester, 170 tons of stone were crushed before 1898, which yielded 131.54 ounces of fine gold, whilst from the Wallace to the same date, 204 tons crushed yielded 151.61 ounces.

Normanby, G.M.L. 1143 (abandoned).—This mine is a quarter of a-mile in a south-easterly direction from the last-mentioned, the reef in which strikes north-east with a dip of 70 degrees to the north-west.

It was worked by an underlay shaft to a depth of 120 feet, which is the water level, and it is between this and the surface that all the work has been done.

This lode, which is two feet in width, is in grano-diorite country, the fissure containing a felspar porphyry dyke as well as the quartz vein.

Up to the year 1898, this lease was worked by the W.A. Venture Syndicate.

Duke of York Deeps, G.M.L. 1421 (abandoned).—This adjoins the Normanby to the eastward, and is possibly upon the same reef, but certainly upon the same dyke fissure.

It formed originally a portion of G.M.L. 799, when a certain mount of development was done upon it, from which, later on, 217 ns of stone were raised.

Table showing the Yield of the Normanby Reef.

Year.	Name and Number of Lease.	Ore Crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1896	Normanby G.M.L. 799	295·00	243·46	·82
1897	Do do	310·00	200 30	·64
1898	Do do	40 00	38·30	·96
1899	Do 1143	172·00	235·98	1·37
1900	Do do	146·00	123·43	·84
1901	Do do	131·00	92 02	·70
1902	Do do	78·50	107·91	1·37
1903	Do do	15·00	11·33	·75
1901	New North Cue G.M.L. 1255	77·00	40·09	·52
1904	Duke of York Deeps G.M.L. 1421	20·00	8·89	·44
1905	Do do	120·00	25·42	·21
1906	Do do	15 00	1·77	·12
	Total	**1,409 50**	**1,123·90**	**·80**

Duke of York, G.M.L. 1275.—This reef, which has a course north-westerly and dips to the south-west, is situated a little to the eastward of the last-mentioned.

It was known as the Great White Eye until the year 1900, after which it was repegged and worked under its present name.

The reef is about 4 feet wide upon the average, and the shoot, which is 180 feet in length at the 160 foot level (water), has a decided dip to the north, so much so, in fact, that only 30 feet of the shoot is in this property at this level, the balance being in the Duke of York Extended. A main vertical shaft has been sunk upon the Duke of York West Extended to a depth of 310 feet, the water level being 109 feet.

In this shaft a so-called formation (felspar porphyry dyke) [6894-5] was cut accompanied by a little quartz which carried no values, this is probably the reef fissure, but since the rich shoot had such a decided dip to the northward there was not any prospect of it being met with in this shaft, which is some four or five chains south of where it should be.

Duke of York Extended, G.M.L. 1287 (abandoned).—This is the northern extension of the same reef, which was of little value at the surface, but since this shoot dipped into it the lower levels turned out good stone. At the water level, to which depth the mine has been worked, there are 150 feet of the shoot in this property.

The main vertical shaft has been sunk to a depth of 209 feet, but little work appears to have been done below the water level. The porphyritic dyke occurs with the lode [**3814**, **3797-8**].

Table showing the Yield of the Duke of York Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.	Total.	
					Ore crushed.	Gold therefrom.
		tons.	ozs.	ozs.	tons.	ozs.
1896	Great White Eye G.M.L. 882	190·00	110·88	·58		
1897	Do. do. ...	59·00	32·54	·55		
1898	Do. do. ...	241·00	88·01	·36		
1899	Do. do. ...	81·50	50·33	·61		
1900	Do. do. ...	17·00	12·09	·71	588·50	293·85
1901	Duke of York G.M.L. 1275	111·00	100·64	·90		
1902	Do. do. ...	440·00	296·84	·67		
1903	Do. do. ...	1,143·00	1,002·69	·87		
1904	Do. do. ...	225·00	63·90	·28		
1905	Do. do. ...	307·00	167·92	·54	2,226·00	1,631·99
1903	Duke of York Extended G.M.L. 1287	174·00	109·00	·63		
1904	Do. do. ...	1,316·00	655·06	·49		
1905	Do. do. ...	729·00	358·81	·49	2,219·00	1,122·87
	Total	...	...	...	**5,033·50**	**3,048·71**

The Agamemnon, G.M.L. 1047. (Plate X.)—This mine is situated upon the north side of a quartz blow about half a mile south of the Duke of York; it was originally worked by a company called the Agamemnon Ltd., who also owned the Tasmania and the Salisbury, the crushings from which were included with the returns from this mine for the years 1898 and 1899.

This company had a plant upon the mine consisting of a 15-head battery with four 40-ton cyanide vats and all necessary winding and pumping plant, but this has now been all removed, as the present owner crushes the stone at his battery upon the Gem of Cue.

This reef is large, forming a conspicuous hill having a general course east and west with a dip of 30 degrees to the northward; it is from 2 to 9 feet in thickness and lies between good walls, one being grano-diorite and the other a basic weathered dyke [**3796**].

There are two well-defined shots of stone, the western of which was worked by the company, who sank a vertical shaft to a depth of 180 feet with a crosscut 31 feet south to the No. 1 level, and another 57 feet north to the No. 2. The No. 1 level was driven 250 feet west and the same distance east, whilst the No. 2 was driven 250 feet west and 150 feet east.

Above the No. 1 level the lode has been stoped for a length f 380 feet to the surface, whilst between the Nos. 1 and 2 the stone was removed for a length of 210 feet.

From the bottom level the reef has been sunk upon for a further distance of 100 feet, but no stoping has been done.

The second or new shoot which is a few chains east is being worked at the present time, it is of considerable size and has been followed down to the water level, which is about 120 feet in vertical depth.

In these workings there are two small throws, one up and one down, but they are of no serious importance.

The large blow to the eastward also carries a little gold, but since it requires simply quarrying it is used to keep the mill going when there is a shortage of higher grade stone.

Table showing the Yield of the Agamemnon Reef.

Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.	Total.		Average Rate per ton.
				Ore crushed.	Gold therefrom.	
	tons.	ozs.	ozs.	tons.	ozs.	ozs.
Agamemnon G.M.L. 1047	50·00	45·32	·90			
Do. do. ...	1,365·50	1,255·89	·92			
Do. do. ...	3,324·00	2,012·99	·60			
Do. do. ...	1,955·00	1,080·02	·55			
Do. do. ...	359·00	255·20	·71			
				7,052·50	4,649·42	·66
Do. do. ...	134·00	66·88	·49			
Do. do. ...	823·00	474·68	·57			
Do. do. ...	1,044·33	816·84	·77			
Do. do. ...	275·00	206·43	·75			
Do. do. ...	659·00	438·88	·65			
Do. do. ...	923·00	424·29	·45			
Do. do. ...	1,859·00	1,077·57	·62			
				5,717·53	3,505·57	·61
Tasmania G.M.L. 483 ...	55·00	21·72	·39			
				55·00	21·72	·39
Total	...	...	...	**12,825·03**	**8,176·71**	**·63**

Immediately north of the Agamemnon are some very old workings upon a well-defined reef which strikes north-east and dips north-west, which was called the Gibraltar, G.M.L. 669, from which 18 tons of stone were raised and crushed in 1897 which yielded 28 ounces of fine gold.

North Bismark, G.M.L., 1442, and *Sarepta, G.M.L.* 1272 (abandoned).—These are situated close to the contact of the grano-diorite with the amphibolites and about one and three-quarter miles north-east of Cue.

The reef strikes a little to the east of north, dipping to the north-west at an angle of 52 degrees, and is about 2 feet in width.

It rises from the flat at the north end in the North Bismark, culminating in a blow in the Sarepta at the south near the contact where it suddenly comes to an end.

A number of shallow shafts have been sunk from which 331.25 tons of stone have been raised from the two leases which yielded 205.96 ounces of fine gold.

Fleur de Mai, G.M.L. 422 (abandoned).—This is an old lease situated about three miles to the eastward of Cue, which has not been worked since the year 1898.

The reef strikes in an easterly direction with a dip to the northward, and is three feet in width, the country being schistose amphibolite. A shaft has been sunk to a depth of 70 feet from which a level was driven 20 feet east and 28 feet west at a depth of 35 feet below the surface.

From this mine 452 tons of stone were crushed which yielded 226.79 ounces of fine gold, equal to about half an ounce to the ton.

The Rose, G.M.L. 1110 (abandoned).—This old lease is situated about half way between the last-mentioned and Cue, the reef has a north-easterly course following a line of porphyritic dyke, which can be traced for a distance of a mile in that direction, the dip is westerly at about 80 degrees, the quartz body being about 18 inches in width.

A considerable quantity of work has been done, the deepest shaft being about 160 feet in vertical depth in the upper portions, this shaft passed through foliated amphibolite but this, deeper down, became massive [3820-2].

A large supply of good water was struck which is at present held as a water right.

The total quantity of stone crushed from it was 375 tons which yielded 84.25 ounces of fine gold.

A little to the eastward are two abandoned leases called the Olive and Pension, in which a ferruginous reef with a north-easterly strike and westerly dip has been worked to a shallow depth, yielding a total of 99 tons of stone from which 113.45 ounces of fine gold were obtained [6898].

Happy Jack, G.M.L. 1509, *Maybell, G.M.L.* 1108, *and Marvel, G.M.L.* 599.—Upon the south-eastern side of the railway line and about 20 chains north-east of the cemetery are a group of leases, the reef in which strikes in a north-westerly direction with a dip to the north-eastward at an angle of about 40 degrees, in the Marvel it is about 18 inches and the country amphibolite. From this lease 50 tons of stone were crushed in 1897, which yielded 18.61 ounces of fine gold.

The Happy Jack line is immediately to the north-westward of the last-mentioned and upon it a fair-sized body of stone is being worked which although it follows the same line of fissure as the Marvel is not a continuous body of stone.

A considerable quantity of work has been done upon this reef for a length of 5 chains along the outcrop, whilst recently a vertical shaft has been sunk to the dip with the object of facilitating the work.

From this reef 274 tons of stone have been treated which yielded 259 ounces of fine gold.

The Maybell is situated a few chains to the westward of the last, and follows a more northerly course but still dips to the eastward.

Only a little work was done on this lease and that as far back as 1897, when a parcel of 15 tons of quartz was crushed which yielded 4.57 ounces of fine gold.

The Catalpa, G.M.L. 1271.—At the south-east corner of the town and upon the western side of the railway line is a reef which rises abruptly from a low hill forming a wall-like outcrop of about 10 feet in height for several chains in length. This reef which contains a little galena is from 2 to 4 feet in width, strikes in a north-easterly direction and dips at an angle of 85 degrees to the north-westward.

A vertical shaft has been sunk to a depth of 113 feet in serpentine schist [3892-3], the water level being 100 feet from the surface where the lode was driven upon for a length of 300 feet. The shoot of stone is said to have been 80 feet in length from which 750½ tons of stone were crushed which yielded 268.06 ounces of fine gold, but as there is no record of what the sands yielded this is not the total yield.

In the year 1899, a 20-head battery was erected upon this lease but as the mine was closed down shortly after it was never used.

The mine is now being reopened by a company who are doing a considerable amount of boring.

At the north end of this reef was the Duchess, G.M.L. 1281, but the workings from which 30 tons, which yielded 9.66 ozs. of fine gold, were obtained have been filled in as it is in the centre of the town.

Princess Royal, G.M.L. 222. (Plate XI.)—This mine lies within the greenstone area upon the south side of the town to the westward and adjoining the Hospital Reserve. It, with several adjoining leases, was worked until recently by a company under the name of the Princess Consolidated Murchison Ltd., but owing to litigation it has passed into the hands of Mr. McDermott, the former manager.

The reef, which ends in a large quartz blow to the northward, has a north-easterly course, but splits in two to the southward, the Royal reef taking a turn more south-westerly, whilst the other branch, which maintains its normal course, has been called the Royal Secret. Both branches dip to the westward at an angle of 48 degrees, and after running a course in a south-westerly direction for about 15 chains from the blow, they are completely lost.

The only portions of the reefs which carry any values are to the southward of their junction, and it is upon the two branches that a considerable amount of work has been done. Upon the Royal reef, which varies from 2 to 5 feet in width, a main shaft was sunk at the north end of the shoot to a depth of 107 feet from which, at a depth of 100 feet, a crosscut was driven 50 feet east which cut the reef, the latter being driven upon (No. 1 level) for a distance of 340 feet south in ore the whole way. From the plan little stoping appears to have been done above this level for the first 150 feet, and none below, but from the remainder all the ore has been taken out up to the surface and down the No. 2 level. The No. 2 level, which is in 170 feet in vertical depth below the surface, is connected with the old main shaft by an underlay, and was driven south for a distance of 340 feet ; from the last 190 feet all the ore has been stoped above to the surface, but none from below.

Above the No. 1 level at the north end the reef became very small, and therefore the stopes were not carried up ; it has recently been discovered, however, that the reef is split by an intrusion some 3 or 4 feet in width, and that there is a good body of stone upon the other wall, which is now being worked up to the surface, this contains a considerable quantity of manganese [6889-90].

In order to facilitate working, a new main vertical shaft was sunk to the westward to a vertical depth of 264 feet, and from this a crosscut was driven to a depth of 255 feet south-south-east for a distance of 80 feet, where a body of stone 4 feet in thickness was cut and driven upon for a distance of 12 feet.

In this shaft a good supply of water was struck at 110 feet, whilst at a depth of 140 feet a hard belt of epidiorite was encountered, which continued to the bottom, and also enclosed the reef. [6891].

The Royal Secret branch is not so large a body of stone, being from 3 inches to one foot in thickness, and it extends for a distance of 3 chains from the junction, for which length it has been stoped to a depth of 80 feet upon the underlay.

There was originally a ten-head battery, four 30-ton cyanide vats, and hauling machinery upon this mine, but it is now mostly dismantled.

Table showing the Yield of the Princess Royal Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
Prior to 1897	Princess Royal G.M.L. 222	414·00	827·67	1·99
1897	Do. do.	3,132·50	2,603·42	·83
1898	Do. do.	2,349·00	1,582·56	·67
1899	Do. do.	...	...	...
1900	Do. do.	33·00	35·86	1·08
1901	Do. do.	348·00	449·17	1·29
1902	Do. do.	...	282·34	...
1904	Do. do.	530·00	263·29	·49
1905	Do. do.	219·00	287·73	·88
1906	Do. do.	360·00	355·66	·95
1902	Royal Secret G.M.L. 1295 ...	419·50	368·21	·87
1904	Do. do. 1411 ...	62·00	19·66	·31
	Total	**7,870·00**	**7,075·57**	**·89**

Lady Forrest, G.M.L. 1375. (Plate XII.)—This old mine is situated within the amphibolite area upon the western side of the road to the south-westward of the Princess Royal.

It strikes east and west, but branches to the eastward, the straight reef being called the Lady Forrest and the northerly one Essler's reef. They both dip at an angle of about 60 degrees to the southward, the main reef being 12 feet in width at the surface and 18 feet at the 90 feet level.

It was originally worked by a main vertical shaft, which is 110 feet in depth, the reefs being driven on at a depth of 90 feet as the water level is at 95 feet, but later on a main underlay shaft was sunk upon Essler's lode to the 90 feet level.

From this latter the reef was driven on at the 90 feet level in a south-westerly direction for a distance of 150 feet to its junction with the Forrest reef, which was driven on 230 feet east and 90 feet west.

At the 75 foot level the Forrest reef was driven in 87 feet, and at the 31 foot level 70 feet, but very little stone was stoped.

There was originally a 20-head battery upon this mine, but this was removed when the company gave it up in 1897, since which time it has been worked by three different parties.

Table showing the Yield of the Lady Forrest Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1897	Lady Forrest G.M.L. 335	920·00	471·94	·57
1900	Do 1217	57·00	57·62	1·10
1901	Do do	137·00	103·94	·75
1902	Cue Fingall G.M.L. 1312	26·00	8·35	·31
1903	Easter Monday G.M.L. 1375	36·00	7·24	·20
	Total ...	1,176·00	649·09	·66

Polar Star, G.M.L. 1277. (Plate XIII.)—This mine is situated upon the southern boundary of the Cue mining district, about one mile and a half to the westward of the town.

It was worked from 1896 to 1899 by a company who did a considerable amount of work upon it and erected a 10-head battery. During the next three years it was vacant, then it became the property of the Murchison Associated Gold Mines, Ltd., when further developments were carried on and a small quantity of stone crushed; during the last two years, however, it has been used only for supplying water to the Rubicon mine, which is owned by the same company.

The reef is within the grano-diorite area, but close to the contact, and appears to be associated with an epidiorite and felspar porphyry dykes, it strikes to the north-eastward, dipping at an angle of from 63 to 70 degrees to the north-westward [3835, 6866-71].

Upon it a vertical shaft has been sunk to a depth of 270 feet, from which a crosscut has been driven 7 feet to the northward at the 238 feet level (No. 4) where the reef has been followed on its course for 40 feet west. The No. 3 level has been driven 15 feet east and 45 feet west of the main shaft at a depth of 208 feet. The No. 2 level, which is in 40 feet west, is connected with the main shaft by a crosscut 32 feet at the 140 feet level. At a vertical depth of 80 feet a crosscut has been driven to the lode a distance of 53 feet south, which has been followed in the No. 1 level for a distance of 160 feet both east and west.

To the westward about 200 feet along the outcrop are two old shafts which have been sunk to an intermediate level, which is 210 feet in length, one of these shafts was also carried on down to the No. 1 level.

Table showing the Yield of the Polar Star Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
Prior to 1897	Polar Star Prop., Ltd., G.M.L. 920	179·00	385·47	2·15
1897	Do do	339·00	513·83	1·51
1898	Do do	198·00	9·42	·04
1899	Do do	108·00	30·78	·28
1903	Do G.M.L. 1277	81·00	110·98	1·37
1904	Do do do	25·00	6·73	·23
1906	Do do 1616	16·50	7·81	·47
	Total	**946·50**	**1,065·02**	**1·12**

Homeward Bound, G.M.L. 1211 (abandoned).—This old mine is situated about 20 chains to the south-westward of the Polar Star, it was worked in the early days of the field upon a reef which strikes in a north-easterly direction and dips to the north-west, the country being amphibolite with epidiorite dykes [**3878, 3882, 6872-4**].

The reef was of considerable size but poor, the gold being carried in small leaders associated with scheelite, and has been tested to a depth of 160 feet, the water level being 100 feet, below which the country is extremely hard.

Table showing the Yield of the Homeward Bound Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
Prior to 1897	Homeward Bound G.M.L. 298	39·00	67·88	1·74
1897	Do. do. do.	8·50	5·49	·64
1901	Cue Homeward Bound G.M.L. 1211	16·00	12·42	·77
	Total	**63·50**	**85·79**	**1·35**

Table showing the Yield of the Productive Leases in the Cue District.

Name and Number of Lease.		Ore crushed.	Gold therefrom.	Rate per ton.
		Tons.	Ozs.	Ozs.
b Agamemnon, Ltd.	483, 1046 and 1047	7,053·50	4,649·42	·66
c Agamemnon	1047 and 1310	5,717·53	3,505·57	·61
a Arcadia	640, 811, 870, 953, 1138	2,395·50	1,602·05	·67
a Arcadia North	1247	23·50	3·40	·14
a Argus	1328	1,134·30	679·52	·59
a Ashbourne	750	669·00	491·43	·73
a Battler's Hope	1284	30·00	8·49	·28
a Bedford	1366	10·00	303·63	30·36
a Belgravia Leases	1056 and 1057	102·00	69·69	·68
a Belgravia Central	789	179·50	204·03	1·13
a Brilliant G.M., N.L.	1115	46·00	14·54	·31
a Buttercup	1109	100·00	58·54	·58
b Caledonia Hill	1068	100·00	101·16	1·01
c Comforter	1234	93·00	41·19	·44
b Catalpa	1088	208·50	72·78	·35
b Catalpa	1271	519·50	189·03	·36
b Catalpa South	1089	23·00	6·28	·27
a City of St. Petersburg	764	10·00	4·52	·45
a Conscript	1067	12·00	9·96	·83
a Countess	1066	408·00	356·13	·87
a Countess	1212	10·00	7·76	·77
a Countess G.M., N.L.	1212 and 1230	164·00	79·68	·48
c Countess Extended	1386	2,426·00	1,294·53	·53
b Cue Consolidated G.M., Ltd.	60, 170, 203, 674, 692, 964, 1002, 1128, 1130, and 1148	23,427·50	18,382·10	·78
a Cue Fingall	1312	26·00	8·35	·31
a Cue Homeward Bound	1211	16·00	12·42	·77
b Cue No. 1 and Princess Ada	203 and 692	10,503·00	8,481·17	·80
c Cue No. 1	203	7,590·00	12,009·96	1·58

b Cue Victory G.M., Ltd.	201, 208, 893, 935, and 825	6,546·00	5,030·78	·77
c Cue Victory	1174	1,608·00	2,326·31	1·44
a Deceiver	1115	1,423·50	2,117·13	1·48
a Deceiver North	1213	168·00	337·22	2·00
b Duchess	1281	30·00	9·66	·32
c Duke of York	1275 and 1344	2,226·00	1,631·99	·73
a Duke of York	1022	30·00	27·15	·90
a Duke of York Deeps	1421	155·00	36·08	·23
a Duke of York Extended	1287	2,219·00	1,122·87	·50
a Easter Monday	1375	36·00	7·24	·20
a Eclipse Leases	248 and 663	630·00	302·25	·48
a Gem	1216	32·00	14·60	·46
c Gem of Cue Extended	1020	20·00	1,504·38	
b Gem of Cue, Ltd.	523, 1020, 1044, 1127, 1152, and 1154	11,724·00	6,746·05	·57
a Gem of Murchison, G.M., Ltd.	538 and 993	60·00	35·67	·59
a George Higinbotham	178	178·00	79·80	·44
a Golden Crow's Nest	1149	10·00	·79	·07
a Golden Garter	1111	620·00	225·50	·36
a Golden Gem	1220	10·00	4·74	·47
a Golden Leaf	889	33·00	42·54	1·29
b Golden Stream Extended	711	2,447·00	2,362·45	·96
c Golden Stream Extended	1359	1,038·00	566·16	·54
a Golden Stream North Extended	1416	97·00	32·28	·33
b Great White Eye	882	588·50	293·85	·49
c Happy Jack	1509	274·00	258·91	·94
a Hard Luck	1159	96·00	55·81	·58
a Hard Nails	1439	46·50	23·18	·49
a Heart of Oak	1427	129·00	73·11	·56
a Highland Mary	718	68·00	7·32	·10
a Homeward Bound	398	47·50	73·37	1·54
a Independent	173	30·00	19·00	·63
c Jubilee	1511	1,110·00	378·19	·34

a Abandoned leases. *b* Abandoned leases now held under other names. *c* Existing leases at the end of 1906.

Table showing the Yield of the Productive Leases in the Cue District—continued.

Name and Number of Lease.		Ore crushed.	Gold therefrom.	Rate per ton.
		Tons.	Ozs.	Ozs.
a Kangaroo	1306	454·50	283·13	·62
a Kangaroo	672	318·00	161·51	·50
a Lady Forrest	335, 696, and 1051	1,114·00	633·50	·57
a Lady Godiva	1116	207·00	114·16	·55
a Lady Haynes	1165	156·00	105·96	·67
b Lady Mary Amalgamated G.M., Ltd.	60, 170, and 674	3,151·00	3,189·25	1·01
b Lady Mary No. 1 South	157	435·50	814·06	1·87
a Le Premier Fleur de Mai	422	452·00	226·79	·50
a Leviathan	183	1,148·50	849·40	·74
b Light of Asia Amalgamated G.M., Ltd.	964 and 1002	2,724·00	1,414·74	·52
c Light of Asia	1148	9,838·00	7,121·36	·72
a Lily	701	623·00	869·92	1·39
a Lily	1494	246·50	151·56	·61
a Lily North	1049	70·00	191·28	2·73
a Lily North Extended	1131	75·00	129·93	1·73
a Lily No. 2 South	697	35·00	23·57	·67
c Little Gem	1542	64·00	62·84	·98
a Little Sparkler	1499	74·50	46·80	·63
a Lombardy	1034 and 1035	345·00	215·17	·62
a Mafekin	1339	138·00	25·62	·18
a Mafekin	1175	97·00	84·42	·87
a Maori	1418	49·00	21·74	·44
a Maori Chief	537	...	59·00	...
a Marvel	599	50·00	18·61	·37
a Maud	1144	152·00	161·89	1·06
a Maybell	1108	15·00	4·57	·30
c Monte Carlo	1530	338·00	198·46	·58
b Murchison Associated G.M., Ltd.	1277	33·50	53·61	1·60
a Mystery	1296	...	1·82	

a New Arcadia	1311	501·00	304·00	·61
a New Arcadia North	1355	100·00	34·94	·34
a New Arcadia North Extended	1453	58·50	33·81	·57
a New Eclipse	1243	51·00	26·99	·52
a New Eldorado	1045	64·50	181·45	2·81
a New England	1107	7·00	8·23	1·03
a New Gem of Murchison	1314	39·00	21·35	·54
a New Leviathan	1390	306·00	174·51	·57
a New North Cue	1255	77·00	40·09	·52
a New Venture	1161	24·00	4·73	·19
c New Volunteer	1135	4,559·00	3,684·52	·80
c New Volunteer Extended	1259	229·00	154·19	·67
a Nil Desperandum	1210	151·00	42·63	·28
a Normanby	1143	542·50	570·67	1·05
a North Bismarck	1442	136·75	110·09	·80
a North Victoria	817	203·00	283·00	1·39
c North Volunteer	1127	27·00	7·72	·29
a Old Francis	1429	28·00	8·00	·28
c Old Princess Ada	1481	889·00	428·18	·48
a Olive	1399	11·00	5·46	·49
a Ophir	1278	31·00	10·20	·33
a Pension	1395	88·00	107·99	1·11
a Perseverance	1329	24·00	27·28	1·13
b Polar Star	1277	72·50	64·10	·88
c Polar Star	1616	16·50	7·81	·47
b Polar Star Proprietary, Ltd.	920	824·00	939·50	1·14
c Princess Ada	1433	1,777·00	677·33	·38
a Princess Ada South	1059	64·00	8·73	·13
b Princess Leases	1150 and 1178	1,790·00	1,354·96	·75
b Princess Murchison Consolidated, Ltd.	222, 653, 1016, 1048, and 1114	6,806·50	6,044·31	·88
c Princess Royal	222	582·00	643·39	1·10
c Queen of the May	1151	5,221·00	5,226·03	1·00

a. Abandoned leases. *b*. Abandoned lease snow held under other names. *c*. Existing leases at the end of 1906.

Table showing the Yield of the Productive Leases in the Cue District—continued.

Name and Number of Lease.		Ore crushed.	Gold therefrom.	Rate per ton.
		Tons.	Ozs.	Ozs.
a Real MacKay	1266	40·00	13·77	·34
a Red White and Blue	745, 746, 1119, and 1121	1,103·00	490·93	·44
a Republic	673	114·00	81·83	·71
a Research	1333	24·00	14·92	·62
a Retreat	1328	45·00	23·01	·51
c Rising Sun	1248	1,198·00	838·62	·70
b Rising Sun North	1262	56·00	36·03	·66
b Rising Sun North	1500	15·00	1·08	·07
a Rose	1110	21·00	10·98	·52
c Rose	1576	127·00	92·92	·73
a Rose of England	662	300 00	38·01	·13
a Rose of England	1286	54·00	35·26	·65
a Royal North	1379	20·00	5·65	·28
a Royal Secret	1411	481·50	387·87	·80
c Salisbury	1374	7,342·50	5,477·27	·74
a Sarepta	1272	194·50	95·87	·49
c South Volunteer	1044	5,479·00	2,733·85	·49
a Stanmore	887	63·00	59·73	·94
c Starlight	1325	1,506·50	1,473·40	·97
a Star of Asia	958	54·00	4·57	·08
c Star of Hope	1551	6·00	4·70	·78
a Struggle	1153	125·00	31·29	·25
c Success	1504	24·50	22·92	·93
a Tasmania	483	55·00	21·72	·39
a Twilight	774	2,357·50	1,807·25	·79
a Twilight South	1090	341·00	205·35	·60
a Two Lillies	1113	180·00	172·30	·95
a Two Nations	865	10·00	9·05	·90
a Union Jack	1279	108·00	34·34	·32

a Victoria	1177	74·50	358·23	4·82
a Victory	1354	503·50	242·74	·48
c Volunteer...	1070	199·50	212·78	1·06
a Volunteer Deeps	1323	20·00	2·01	·10
a Volunteer North	1350	121·50	29·73	·24
c Volunteer South Extended	1145	20,068·00	10,829·10	·54
a Wallace	999	34·00	20·07	·59
a W.A. Venture Syndicate, Ltd.	799	645·00	482·06	·74
a Welcome	1308	130·00	46·53	·35
a West Australian	1172	100·00	9·39	·09
a Winchester	1009	170·00	131·54	·77
a Young Colonial	1297	197·50	264·63	1·34
Sundry claims		5,140·25	3,699·08	·72
Sundry parcels crushed prior to 1899		2,154·00	3,166·30	1·47
Do treated at Cue Public Battery		2,576·00	1,287·73	·49
Do do Cue No. 1 Battery and Works		2,463·50	1,102·71	·44
*Do do Cue Victory Battery		1,388·52	4,061·56	2·91
Sands treated by Cue Gold Recovery Co.		...	4,369·45	
Do Lady Mary Cyanide Works		...	3,180·40	
Do Gem of Cue Cyanide Works		...	4,786·83	
Total		201,952·85	169,433·53	·83

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a. Abandoned leases. *b*. Abandoned leases now held under other names. *c*. Existing leases at the end of 1906.

* Includes a considerable quantity of sands cyanided.

SECTION III.—THE CUDDINGWARRA SUB-MINING DISTRICT.

(With a Geological Map.)

GENERAL.

This mining centre, which was discovered in the year 1891, was originally known as the Dead Finish; it is about seven miles to the north-westward of Cue, with which town it is connected by a telephone, and a mail service twice a week.

It lies upon the eastern side of a range of hills which terminate at a point a little to the northward of the town where one of the main drainage channels flowing towards Austin's Lake crosses this belt in a south-westerly direction. In the bed of this channel several fine fresh water pools have been formed, which furnish not only the domestic supply of the district but also the boiler feed-water to the Victory United Mine.

To the eastward of the town is a stretch of comparatively low and level country, covered by large alluvial flats from which rise occasionally razor-backed ridges or isolated rocky hills or pinnacles (Photo. No. 12).

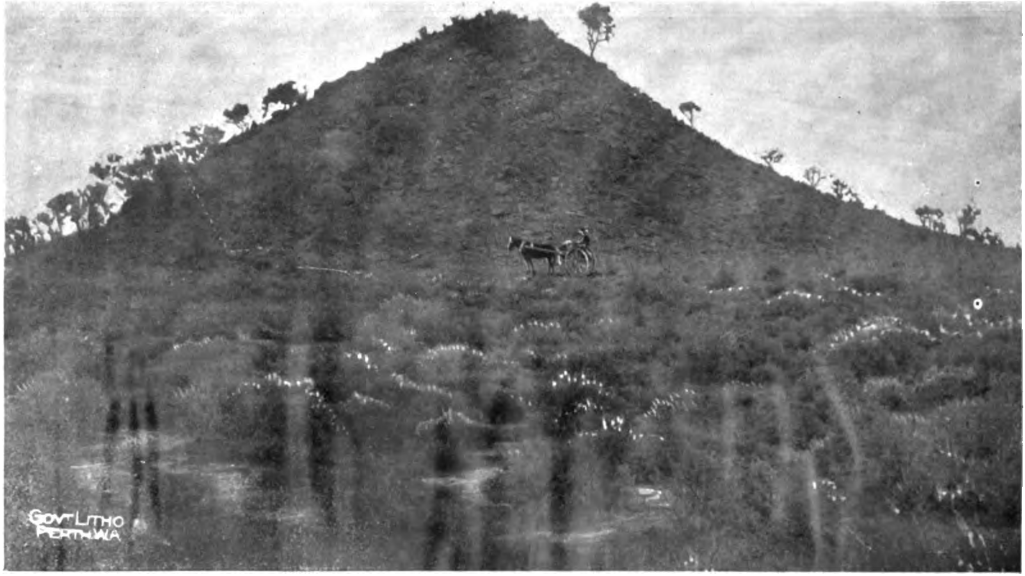
From these flats, which are for the most part strewn with quartz and ironstone fragments and covered by a coarse salt herbage, there is a fall both towards the north and south, but so slight that no watercourses have been formed, and, as a consequence, after heavy rains large areas are flooded.

One of the great drawbacks to prospecting in this district is the large volume of salt water met with at a very shallow depth, whilst the water level appears to be closer to the surface at the present time than it was in 1895, since a difference of about 10 feet exists in every instance mentioned by Mr. Goczel in his report of that date.

Timber for mining purposes is very scarce, and has to be carted in from a considerable distance, whilst even the firewood supply is fast becoming a serious item.

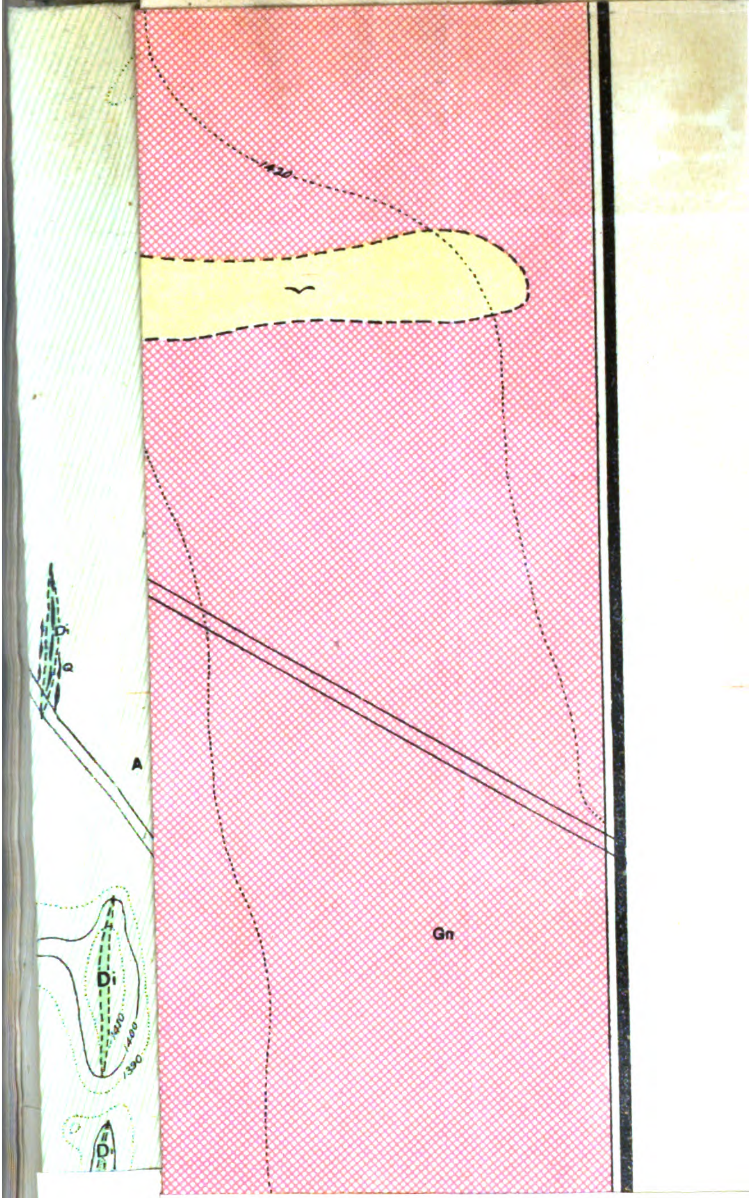
Since its discovery this district is credited in the official statistics with the production of 26,629 tons of stone which yielded 35,293 ounces of fine gold, being at the rate of about one ounce six dwts. of gold per ton, but owing to the fact that it was not compulsory for companies to furnish the Government with returns until the year 1897, five years of the most prosperous portion of this district's existence had passed, of which there is no authentic record.

Since the year 1897, the records show that 29 out of the total number of leases held have been productive: these upon analysis prove to represent only 15 areas, some of which have been held and



Photo, H. P. Woodward.

Pinnacle Hill, near Cuddingwarra.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abandoned more than once under changed names. At the present time only three leases are in force, of these the Victory United Company holds two, whilst the other, now known as the Emily, is the same ground as held previously under the names of the Golden Fleece, Windmill, and Oxonian, and it is being reopened by a working party.

Little alluvial gold was won in this district, the patches being poor, small, and shallow, but there is no record of the actual quantity obtained.

The following table gives the official figures of the total production of each lease held in this district up till the end of 1906.

Table showing the Yield of the Production Leases of the Cuddingwarra District up to 1906.

Year.	Name and number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1900	Amy Florence G.M.L. 1166	176·00	221·44	1·26
1897	Black Swan G.M.L. 867 ...	60·00	137·15	2·28
1899	Blue Bell G.M.L. 846 ...	72·00	15·86	·22
Prior to 1897	Blue Bell Proprietary G.M.L. 925, etc.	84·00	243·46	
Prior to 1897	Bonanza G.M.L. 1055 ...	42·00	38·01	·90
1897 to 1901	City of Chester G.M.L. 525	1,359·00	1,045·44	·77
1900	City of Sydney G.M.L. 1235	95·00	86·10	·89
1905–6	Emily G.M.L. 1510	76·50	90·49	1·18
1897	Fairlight G.M.L. 386 ...	150·00	72·26	·48
1896–7	Fortune of War G.M.L. 95	2,231·00	2,041·38	·91
Prior to 1897	Golden Fleece G.M.L. 1873	84·00	58·83	·70
1895 to 1903	Golden Gate G.M.L. 634, etc.	4,690·50	4,263·39	·90
1895 to 1897	Greymouth G.M.L. 968 ...	170·00	445·49	2·62
1898	Kallara G.M.L. 716 ...	...	36·00	
1896 to 1898	Lady Rosie G.M.L. 790 ...	275·00	241·60	·89
1899	Laura G.M.L. 1160	130·00	23·05	·17
1899	Moonlight G.M.L. 505 ...	15·50	5·57	·36
1899–1900	Oxonian G.M.L. 1146 ...	174·00	219·77	1·26
1896–1891	Rheingold G.M.L. 671 ...	333·00	342·76	1·02
1904–5	Rheingold G.M.L. 142 ...	97·00	69·54	·71
1900	Rose G.M.L. 1238	10·00	2·65	·26
1903	Royal Mint G.M.L. 1376 ...	141·00	106·32	·75
1904–5	Royal Mint 1422	287·00	179·54	·62
1904–5	Scotia G.M.L. 1440	932·00	273·67	·29
1903	South Victory G.M.L. 1364	58·00	53·75	·92
1900	Venus G.M.L. 1215... ...	...	9·49	
1901	Venus G.M.L. 1268... ...	...	4·92	
1894 to 1906	Victory United G.M.L. 595 etc.	14,456·00	24·828·77	1·71
1905	Whisper Low G.M.L. 1491	21·00	19·77	·94
1898	Windmill G.M.L. 1120 ...	127·25	63·23	·49
	Sundry Claims	283·50	222·07	·78
	Total	**26,644·25**	**35,461·78**	**1·33**

DESCRIPTIVE GEOLOGY.

The geological map which accompanies this section of the report adjoins the Cue sheet to the eastward, and includes the western boundary of the grano-diorite belt which is so largely developed in that district.

The line of contact of the grano-diorites with the amphibolites will be seen to run in a north-easterly direction, the former rock covering only a small wedge-shaped area upon the eastern side of the map, whilst the amphibolites occupy the remainder. The main auriferous belt of this district is about 5 miles in length, and has a north-westerly strike lying well within the amphibolite area about 2½ miles to the westward of their main contact with the grano-diorite, whilst the minor belt also exists still within the amphibolite area, but close to the contact zone. The first-mentioned belt is traversed longitudinally by a series of large felsitic dykes, which appears to have played an important part in the formation and enrichment of the reefs.

Recent and Superficial Deposits.—Fully one-half of the area included by the Geological Map is covered by shallow superficial deposits, which have evidently been formed by the gradual disintegration of the rocks *in situ*. These deposits are of little thickness, consisting for the most part of reddish coloured clays, the surface of which is thickly strewn with angular fragments of quartz and ironstone. Over the surface of these, which are fairly level, the wind sweeps with considerable force, carrying with it any loose particles of sand, which are again dropped where an obstacle is encountered, and thus in time form sandhills.

These deposits, which have been mapped in as alluvium for the want of a better term, have so far proved to be of no commercial value, for although, as previously stated, their surface is strewn with large quantities of quartz, this mineral has so far proved to be entirely destitute of gold.

Laterites.—These deposits at the present time only occur as isolated ironstone cappings upon two or three small hills, but in the past they must have been extensive, as their detrital matter is strewn over a very considerable area.

Although these detrital laterites are the only superficial deposits which have proved so far to possess any economic value, it was found impossible to delineate their boundaries upon the map since they consist solely of ironstone fragments, which may be scattered either over the crystalline rocks or clay flats, merging imperceptibly into true laterites upon the one hand and the alluvium upon the other.

One or two shallow dryblowing patches were discovered in this deposit in the early days, from which a limited quantity of gold was obtained.

Crystalline Rocks.—Here, like the majority of the goldfields f Western Australia, the superficial deposits rest directly upon the rystalline series, which consist of both acidic and basic rocks raversed by numerous dykes and quartz reefs.

The basic series are the most largely developed, consisting ainly of rocks which may be conveniently classed under the general ead of amphibolites, the foliation of which follows a course a little to the west of north with a dip to the eastward [6910-1]

The origin of these rocks has not yet been definitely determined, but their general character and chemical composition point rather to their igneous than to their sedimentary origin, and this hypothesis is further supported by the fact that it is much simpler or the pyroxene in the diabase to be altered into hornblende under dynamic metamorphic action than for the sedimentary rocks to be changed by regional metamorphism into crystalline rocks of so uniform a character over so large an area.

On account of the nearness of the water level to the surface the oxidised zone is of very limited extent, but on the other hand the zone in which the influences of hydration have been exercised is considerable, for at a depth of 700 feet in the Victory United mine rocks illustrative of this action are met with. The alteration of the rocks to so great a depth is probably only local, being due to the circulation of the ground waters along the lode fissure which is much faulted and intersected by cross dykes, since these influences have by no means generally affected the rocks of this district, for massive amphibolites are met with in sinking at quite shallow depth in other mines.

In the zone where hydration has taken place the hornblende has been largely altered into chlorite, and sometimes even into chloritic schists, whilst in the oxidised zone these have been further changed into greasy yellow magnesian shales and clays.

The acidic series are represented by the western margin of the large magmatic intrusion of grano-diorite, which lies to the eastward, but since these rocks are of no economic value upon their western edge and have been very fully dealt with in the Cue section of this report, it will be unnecessary to dwell further upon them in this place.

Intrusive dykes.—In both the amphibolite and granite areas the rocks are intersected in belts by numerous intrusive dykes, which may be divided into three classes, one of which is basic and two acidic.

The basic dykes, which are mostly epidiorite, are only met with towards the eastern side of the amphibolite area near the contact zone, with which their course is generally more or less parallel.

These are evidently altered diabase rocks in which paramorphic action has taken place, changing the augite, of which traces still remain, into hornblende.

The acidic dykes are of two classes: 1st, those which follow a more or less north-westerly course; and 2nd, those which follow an erratic course.

The first of these are felsites, occurring as well-defined ridge lines in the auriferous belts, and they have in all probability exercised considerable influence both upon the formation and enrichment of the lodes.

This series of fine-grained felsites can only be examined at the surface where the rock is more or less weathered, and in consequence it is impossible to determine with any degree of certainty their true nature, but to judge from their general character, microscopic structure, and composition, they in all probability belong to the older volcanic series, and may be classed amongst the Rhyolites [6312].

The second series of dykes, which are felspar porphyries, are most largely developed upon the range to the westward of the auriferous belt, and are also met with upon the eastern side, close to the contact of the grano-diorite.

These rocks, as a rule, appear to have undergone little alteration, for even when sections have been made from surface specimens they exhibit a perfect crystalline structure. [6903, 6907.]

The dykes of this class follow no definite course, but those having a north-easterly direction are of by far the most common, whilst the remainder cross, branch off, and junction, forming an irregular network with them.

In the Victory United mine one of these dykes crosses the lode at the northern extremity of the shoot, but since it cuts clean through the lode it is evidently of later origin [6909].

Quartz Reefs and Lodes.—There are two classes of reefs, the first of which are the parallel contacts, which follow a general north-westerly course, and secondly the radiating, which have a more north-easterly course.

The first group lie parallel to, or sometimes even occupy the same fissure as the felsite dykes. These are the most numerous, comprising the Golden Gate, City of Chester, City of Sydney, Black Swan, Fairlight, Lady Rosie, and South Victory reefs, which with the exception of the last two that are situated at the south end of the belt, dip to the eastward.

Upon the eastern margin of the amphibolite area there are a series of small reefs belonging to this class including the Golden Fleece, Treasure Trove, and Kallara, which occur as parallel contacts to the grano-diorite.

The second class of reefs, although by no means so numerous, have so far proved to be the most productive, since they include the Victory United, Rheingold, Blue Bell, and Greymouth, all of which, with the exception of the last-mentioned, dip to the south-east.

Most of the reefs of this district are small, but of high grade, whilst the shoots of stone, if defined at all, are narrow, but so far, with the exception of the Victory United, little work has been done in order to prove their character at a depth.

SECTION IV.—THE MINES OF CUDDINGWARRA.

GENERAL.

Only one mine in the district was accessible at the time of inspection, which was the Victory United, and in this mine only the No. 4 level could be examined, and, as a consequence, the following information has been compiled from all possible official sources added to that most kindly supplied by Mr. Isaac Genge, who has been connected with nearly every mine in the district.

The object of this being to place on record a description as accurate as possible of the nature of the work done upon old abandoned and inaccessible mines, with the amount of stone crushed and gold therefrom, for reference, in case it should be desired to work them again in the future. The various mines described will be found by reference to the Geological Map.

DESCRIPTION OF MINES.

City of Chester, G.M.L. 252 (abandoned).—This is the most northerly lease in the Cuddingwarra district, and lies across the river just outside the two-mile radius from the post office.

There are two lines of reef which both strike north-west and south-east, with an underlay to the north-east.

Upon the western line a vertical two-compartment engine shaft has been sunk to a depth of 120 feet, in which a large supply of salt water was cut at a depth of 15 feet from the surface.

From the bottom of this shaft, a crosscut has been driven west for a distance of 50 feet to the reef, where a level 100 feet in length was driven, which is connected with the surface by two underlying shafts.

The reef with what is called a footwall formation of felspar porphyry [6908] varies from 18 inches to many feet, and has been stoped up from the 120-foot level to the surface.

The eastern reef varies from one to three feet in width, and can be traced for a distance of 30 chains south from a quartz blow; it appears to follow a dyke like the western reef, two feet of which, in a weathered condition, is visible upon the footwall side in an open cut.

It has been opened up by four underlay shafts, the deepest of which is 120 feet, with a level from the bottom of 200 feet in length. There is also a level at 40 feet below the surface, from which stopes have been carried up to the open cut.

The country for the most part is solid amphibolite, but certain schistose portions met with in sinking rendered close timbering necessary.

There has been a crushing mill, cyaniding plant, winding engine, and pumps upon this mine, but these have all been removed as the mine has been abandoned for five years.

Table showing the Yield of the City of Chester Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
1897	City of Chester G.M.L. 252 ...	116·00	100·00	·86
1898	Do. do. ...	203·00	117·77	·56
1900	Do. do. ...	90·00	32·85	·36
1901	Do. do. ...	950·00	794·12	·83
	Total	**1,359·00**	**1,045·44**	**·77**

City of Sydney, G.M.L. 1235 (abandoned).—This mine is the northernmost of the town group, and situated about half a mile north-east of the post office.

The reef has a course north-west, with a dip of between 60 and 70 degrees to the westward.

A vertical shaft has been sunk to a depth of 70 feet, and the reef, which varies from a few inches to several feet in thickness, has been driven on for a length of 80 feet, and stoped to the surface, the only record of any crushing being in 1900, when 95 tons yielded 86 ounces of fine gold. The country appears to be hard amphibolite below the water level, which is 15 feet below the surface and extremely salt.

Blue Bell, G.M.Ls. 846, 748 (abandoned).—This old mine lies between the City of Sydney and the town; it was worked in the very early days, even at the time of Mr. Goczel's visit in 1894, who states that a certain amount of work had been done, and that 100 tons of stone were at grass awaiting treatment.

This reef strikes in a north-east direction, dipping to the south-east at an angle of 42 degrees, and varies in size from 6 inches to 4 feet, with an average of 18 inches.

There is a large supply of salt water, which now stands at 15 feet from the surface, but this water level at the time of Mr. Goczel's visit was 26 feet, at which level the reef has been driven on for a length of 300 feet, above which most of the stone has been stoped to the surface.

Close to the southern boundary of G.M.L. 846 a main vertical engine shaft has been sunk to a depth of 120 feet, from which a crosscut has been driven to the westward 130 feet, when a number of quartz leaders were cut, but no defined reef.

In the southern lease there are a number of reefs, or spurs off a main fissure, which terminate in a blow at the south end, and upon these a considerable quantity of work has been done to a shallow depth. There appears to have been only one parcel of stone crushed since records were kept, this was 72 tons in 1899, which yielded about 16 ounces of gold ; all previous records appear to have been lost.

Blue Bell Proprietary, Ltd., 925, etc. (abandoned).—This company owned a number of leases known as the Blue Bell and W.A. blocks; they occupied all the spare ground between the Golden Gate and the Victory United and Blue Bell leases.

A considerable amount of shaft sinking and trenching has been done, but there is only a record of 84 tons of stone being crushed, which yielded 22 ounces ; later on there is a footnote stating that 220 ounces were reported, but the quantity of stone crushed omitted.

The Venus, G.M.L. 1268 *and Whisper Low, G.M.L.* 1491 were both parts of this area after its abandonment by the company, the recent owners only scratching out a little stone from the old workings, only 21 tons of which were crushed, from which about 19 ounces of gold were obtained, while 14½ ounces were obtained by dollying.

Fairlight, or Laura, G.M.L. 386 (abandoned).—This lease was situated to the southward of the Blue Bell, and upon it a small reef with a north and south course, varying from one to two feet in thickness, was opened up by two underlay shafts and a vertical one 80 feet in depth, at the bottom of which there is a drive 30 feet in length.

Two crushings are reported from this reef, one in 1897 and the other in 1899, the total from which was 280 tons, which yielded 95.31 ounces of fine gold.

Golden Gate, G.M.L. 634, *etc.* (abandoned). Plate XIV.—This mine was situated upon a main felsite dyke [**6912** which strikes in a north-westerly direction, lying about half a mile to the eastward of the town.

It consisted of three leases, which were worked between 1897 and 1901 by a company known as the Cuddingwarra Gold Mines, Ltd., which company did a considerable amount of work consisting of a main vertical shaft 190 feet, with a drive at the 110-feet level for a distance of 425 feet north and 265 feet south.

There are also a number of short levels at a depth of 40 feet below the surface (which was just above the water level), above which a good deal of stoping was done up to the surface, where the cap of the reef has been removed for a length of 300 feet.

In the 110-feet level there appear to be two shoots. The one where the crosscut from the main shaft cut the lode is 120 feet in length, whilst about 50 feet farther north there is another which is 80 feet in length. Both of these shoots have been stoped up to the 40 feet level, the stone, which averaged about 3 feet in thickness, was contained in a broken formation (dyke ?).

The water is very salt, and is now standing at a depth of 18 feet below the surface.

This company had a Krupp ball mill on this mine, with a Cornish lift and winding plant.

Later on this mine passed into the hands of the Fingall Proprietary, Ltd., who did little with it, whilst during the years 1904 and 1905 it was worked under the name of the Scotia, when a battery was placed upon it.

Table showing the Yield of the Golden Ghte Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	Ozs.	Ozs.
Prior to 1897	Golden Gate G.M.L. 634	238·00	118·56	·49
1897	Cuddingwarra G.M., Ltd., 634, etc.	77·00	42·07	·54
1898	Do. do. ...	3,351·50	1,978·62	·59
1899	Do. do. ...	667·00	980·71	1·47
1900	Do. do. ...	100·00	986·15	9·86
1901	Do. do. ...	...	...	...
1902	Fingall Proprietary, Ltd. ...	85·00	32·95	·38
1903	Do. do. ...	172·00	124·33	·72
1904	Scotia G.M.L. 1440 ...	80·00	47·90	·59
1905	Do. do. ...	852·00	225·77	·26
	Total	**6,722·50**	**4,537·00**	**·67**

Victory United, G.M.L. 595, 1122 (Plate XV.).—This mine is situated about half a-mile to the township of Cuddingwarra, and it has been worked continuously since the discovery of this field.

It was originally held by two companies, the one which owned most of the outcrop being called the Fortune of War, whilst the other into whose property the shoot dipped was called the Victory United. In the year 1898, these two companies were amalgamated, and they also acquired the Rheingold, a property lying a little farther to the southward, when these were worked in conjunction, the returns being bulked up to 1901, after which the Rheingold property was thrown up and only the Victory United reef was worked. The reef has a north-easterly course dipping at a high angle to the south-eastward, with an outcrop of 210 feet at the surface, the whole of the stone from which has been stoped out.

Most of the early workings were carried on from shallow surface shafts, but later on the company sunk a main vertical shaft to the eastward, which is now down 700 feet.

Judging from the plans of the workings a well defined shoot of stone existed which has a decided northerly dip, but appears to decrease slightly in length with depth, but still carries very good values.

In the No. 4 (600 feet) level the vein, where cut, starts abruptly from a cross felspar porphyry dyke [6909], whilst at the southern end of the shoot it is cut off by a diagonal fault which displaces the vein. About 100 feet to the southward of this fault a small rich bunch of stone was cut, which was risen on when it proved payable for a distance of 30 feet. Southward of this the reef is again faulted and broken, but the fissure should be easily picked up by cross-cutting at the face.

The main rich shoot has been followed by a winze from this level for 100 feet, in which it proved to be of good value and is a well defined body of stone.

The main shaft encountered the porphyritic dyke, but near the lode a considerable quantity of crushed country was met with which rendered sinking very difficult.

In this mine the reef has averaged about 2 feet in thickness, but although small, its value of over 1½ ounces has made it pay well; it is a nice looking mineralised stone containing a little copper, lead, and zinc in the form of sulphides, which pay well to concentrate.

The plant for the most part is old, but a large new compressor has recently been added, also two boilers, one Lancashire and one Babcock's, the latter proving to be practically valueless, since the feed-water contains too large a percentage of salts.

Table showing the Yield of the Victory United Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
Prior to 1897	Fortune of War G.M.L. 95	1,580·00	1,368·42	·86
1897	Do. do.	651·00	672·96	1·03
Prior to 1897	Victory United G.M.L 595	2,272·00	4,798·83	2·11
1897	Do. do.	701·00	1,545·16	2·20
1898	Do. G.M.L. 595, 1122 & 671	1,854·00	2,903·18	1·56
1899	Do do.	1670·00	4,775·05	2·85
1900	Do. do.	485·00	1,906·08	3·93
1901	Do. do.	430·00	424·00	·99
1902	Do. G.M.L. 595 & 1122	143·00	385·44	2·76
1903	Do. do.	140·00	470·98	3·36
1904	Do. do.	1,426·00	1,508·09	1·05
1905	Do. do.	2,558·00	2,533·16	·99
1906	Do. do.	2,777·00	3,578·77	1·28
	Total	**16,687·00**	**26,870·12**	**1·61**

Black Swan, G.M.L. 867 (abandoned).—This is an old lease upon the salt flat to the southward of the Golden Gate ; it has not been worked since 1897, when 60 tons of stone were raised which yielded 9.15 ounces of gold.

Greymouth, G.M.L. 968 (abandoned).—This lies a little to the south-westward of the last-mentioned, upon a reef which strikes south-westerly from the main dyke ridge.

A number of shafts have been sunk, mostly upon the underlay to the westward, but one vertical has been sunk to a depth of 120 feet, in which the water level was 15 feet below the surface.

During the years 1897 and those preceding it, 170 tons of stone were crushed from this mine which yielded 445½ ounces of fine gold.

Rheingold, G.M.Ls. 671, 726 (abandoned).—This is a north-easterly and south-westerly reef, which lies about half a-mile south of the Victory United.

Upon this lode, which underlays to the south-eastward a very considerable amount of work has been done, first by the prospectors, and then, after 1897, by the Victory United Company until 1901, when it was abandoned, but was taken up again by a working party and held during 1904 and 1905.

A main three-compartment vertical winding shaft was sunk to a depth of 120 feet, and a crosscut driven 160 feet at the 90 foot level to the lode, which is here from 18 inches to 4 feet in thickness. There are several shafts down to 40 feet with two levels, each driven 100 feet in length, above which stopes have been carried up to a height of 30 feet, the stone varying from 2 inches to 10 feet.

The water, which is salt, and is in considerable quantity, is now standing at 20 feet from the surface.

Table showing the Yield of the Rheingold Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	Ozs.	Ozs.
Prior to 1897	Rheingold G.M.L. 671 and 726	108·00	106·79	·98
1897	Do. do. ...	225·00	235·97	1·04
1898	Returns included in those of the Victory United			
1899				
1900				
1901				
1902				
1903				
1904	Rheingold G.M.L. 1420 ...	55·00	48·65	·88
1905	Do. do ...	42·00	20·89	·49
	Total	**430·00**	**412·30**	**·95**

Bonanza, G.M.L. 1055 (abandoned).—This old mine is situated upon the main road between Cuddingwarra and Day Dawn, about 1½ miles south of the former township.

The reef has a north-east and south-west strike, with an underlay to the south-east, upon which a vertical shaft was sunk to a depth of 42 feet, with a drive 15 feet, from which a stope was carried up to an open cut at the surface in which the stone averaged about 18 inches, of which 42 tons were crushed prior to the year 1897, which is reported to have yielded 38 ounces of fine gold.

The water supply was very heavy, and in consequence further sinking could not be carried on without the aid of machinery.

Lady Rosie, G.M.L. 790 (abandoned).—This old mine, which is situated about half a mile to the southward of the last-mentioned has been worked off and on under various names from 1896 to 1905.

The reef has a general north and south course, with an underlay to westward, and is from 6 inches to 2 feet in thickness. Upon it a considerable quantity of work has been done. A main vertical two-compartment winding shaft has been sunk to a depth of 120 feet, when the reef was driven on for a length of 100 feet; the water, which is salt, now stands in this shaft up to the 40 feet level.

Table showing the Yield of the Rose Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	ozs.	ozs.
Prior to 1897	Lady Rosie G.M.L. 790 ...	85·00	87 79	1·03
1897	Do. do. ...	90·00	95·44	1·60
1898	Do. do. ...	100·00	58·37	·58
1900	Amy Florence G.M.L. 1166	176·00	221·44	1·26
1900	Rose G.M.L. 38	10·00	2·65	·26
1903	Royal Mint G.M.L. 1376 ...	141·00	106 32	·75
1904	Do. G.M.L. 1422 ...	265·00	160·25	·60
1905	Do. do. ...	22·00	19 29	·87
	Total	**889 00**	**751·55**	**·84**

South Victory, G.M.L. 1364.—This is situated about 20 chains south of the last-mentioned ; it is a large reef, striking north and south, and dips at a high angle to the westward. Two shallow underlay shafts have been sunk, and two vertically to the reef, from which 58 tons of stone have been crushed, which yielded 53¾ ounces of gold.

Golden Fleece, now Emily, G.M.L. 1510.—This mine is about 2½ miles in a north-easterly direction from Cuddingwarra, near the contact zone of the amphibolites with the grano-diorites, it has been worked in an intermittent manner under various names since 1896.

There are two reefs upon this lease, one the main Golden Fleece reef has a north-easterly course, dipping to the eastward: it has been worked from the surface by an open cut and underlay shaft, whilst a vertical shaft has been sunk to cut it to the dip.

The southern reef has a more east and west course with a dip of 40 degrees south, and it appears to be a lenticular body.

An old shaft has been sunk on it to a depth of 90 feet, and the reef driven on to the westward, when it became small in the face. Stopes were carried up from this level to within 36 feet of the surface. A new vertical shaft is being sunk at the west end of this reef with the idea of testing it at its junction with the Fleece lode.

Table showing the Yield of the Golden Fleece Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		tons.	Ozs	Ozs.
Prior to 1897	Golden Fleece G.M.L. 873	84·00	58·83	·70
1898	Windmill, G.M.L. 1120 ...	127·25	63·23	·49
1899	Oxonian, G.M.L. 1146 ...	151·00	188·05	1·24
1900	Do. do. ...	23·00	31·72	1·37
1905	Emily G.M.L. 1510 ...	6·00	7·77	1·13
1906	Do. do. ...	70·50	82·72	1·17
	Total	**461·75**	**432·32**	**·93**

Treasure Trove, G.M.L. 874, 836.—This lies about a mile south of the Fleece, and upon these a considerable amount of work was done in the early days by the Anglo-W.A. General Exploration, Limited.

There is no defined reef but a series of veins which follow a more or less north and south course parallel to the contact and dipping east towards the granite.

There is only a record of one crushing in which 74 tons of stone are stated to have yielded 55 ounces of fine gold.

IN CONCLUSION.

It will be seen from the foregoing that only a partial record can be obtained of the production of this district, and only an authentic one for the last 10 years, during which period mining has not been brisk in this locality, but it will be noticed that in general the returns are high, and that prospecting is almost impossible for working miners without capital in face of the large quantity of water they have to contend with, therefore, it is to be hoped that the compilation of these particulars, meagre and unsatisfactory as they are, may have the result of directing attention to a district which, in spite of the fact that the stone is rich, has never attracted it because it is off the beaten track.

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WESTERN AUSTRALIA.

GEOLOGICAL SURVEY.

BULLETIN No. 29.

A Report upon the Geology, together with a Description of the Productive Mines

OF THE

CUE AND DAY DAWN DISTRICTS,

MURCHISON GOLDFIELD.

PART II.

DAY DAWN CENTRE.

BY

HARRY P. WOODWARD,
Assistant Government Geologist.

Issued under the authority of the Hon. H. Gregory, M.L.A., Minister for Mines.

WITH TWO MAPS AND 8 PLATES OF SECTIONS.

PERTH:
BY AUTHORITY: FRED. WM. SIMPSON, GOVERNMENT PRINTER.
1907.

Part II.

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A Report upon the Geology, together with a Description of the Productive Mines of the Cue and Day Dawn District.

INTRODUCTION.

This section of Bulletin No. 29 deals with a portion of the area covered by the Day Dawn Mining District which adjoins the Cue District to the southward. The geological map which accompanies Part I. will be found to join the sheet in the present issue.

The district offers certain advantages for scientific investigation owing to the fact that one large ore body has been developed to a considerable depth; from a technical point of view the processes adopted for the recovery of the gold are of the very highest interest, whilst from an economic standpoint the interest centres around the fact that we have here a low-grade mine which, owing to excellent management, is being worked at a profit under considerable adverse circumstances.

This mine, which is called the Great Fingall, so completely overshadows the others that they pale into insignificance beside it, as will be seen from the following tabular statement in which 95.38 per cent. of the total production of 778,606 ounces from the district up to the end of 1906 is credited to it, whilst of the remainder eight mines only have produced over 1,000 ounces, and are credited with 3.71 per cent., and 48 others, including sundry crushings and claims, contribute the balance of .91 per cent.

It will be therefore recognised from the above statement of what vital importance this mine is not only to the town but to the district generally, and how the pulse of the population must respond to the rise and fall of its values as a barometer does to the change of the atmosphere.

My best thanks are due to Mr. Gerard Lovell, the Superintendent of the Great Fingall Mine, and his staff, also to Mr. Robert Tyler, Manager of the Murchison Associated and East Fingall, for the very courteous manner in which they rendered me every assistance, and also to Captains Hoskins and Jewett for information supplied.

HARRY P. WOODWARD,
Assistant Government Geologist.

Geological Survey Office, Perth, 15th July, 1907.

Table showing the Comparative Production of the Great Fingall and other Mines of Day Dawn up to the end of 1906.

Name and Number of Lease.	Ore Crushed.	Gold therefrom.	Rate per ton.	Total.		Percentage of Total.	
				Ore Crushed.	Gold therefrom.	Ore Crushed.	Gold therefrom.
	Tons.	Ozs.	Ozs.	Tons.	Ozs.	Ozs.	Ozs.
The Great Fingall Mine	795,077.00	742,612.95	.93	795,077.00	742,612.95	94.20	95.38
The Day Dawn West Mine ..	11,127.00	7,958.98	.71	43,526.80	28,917.19	5.16	3.71
The Trenton Mine	8,746.10	6,197.98	.71				
The Kinsella Mine	12,865.00	4,984.06	.38				
The Emperor Mine	1,849.70	2,874.76	1.50				
The Rubicon Mine	3,503.50	2,216.61	.63				
The East Fingall Mine	2,488.50	2,001.68	.80				
The Crœsus Mine	1,138.00	1,640.41	1.44				
The Mount Fingall Mine ..	1,809.00	1,042.71	.57				
Other Mines	4,041.25	4,630.32	1.14	5,419.25	7,076.06	.64	.91
Sundry Claims and Crushings ..	1,378.00	2,245.74	1.76				
Total	..	..	..	844,023.05	778,606.20	100.00	100.00

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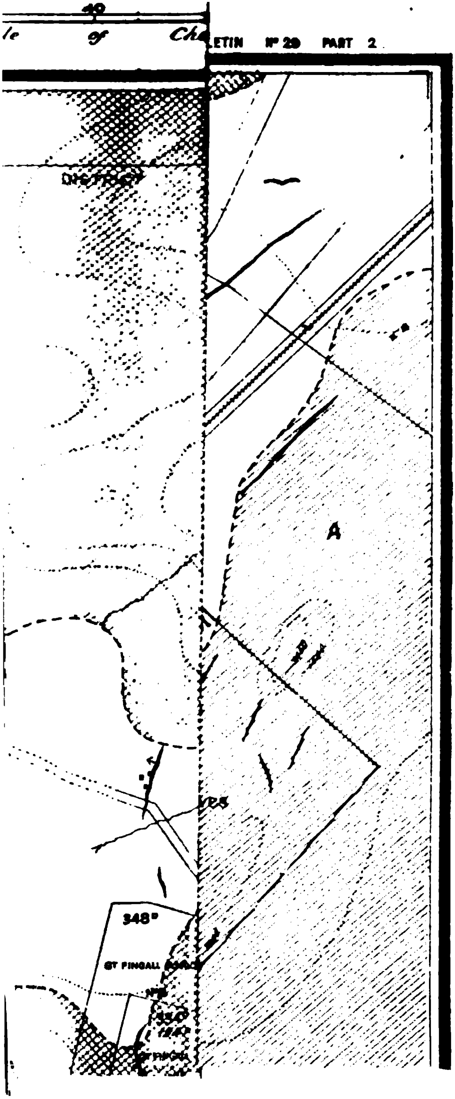


PART II.—DAY DAWN CENTRE.

SECTION I.—THE DAY DAWN DISTRICT.

(With a Geological Map.)

GENERAL.

This district is situated to the south and immediately adjoining that of Cue, the two township centres being only three miles apart, and connected by railway, road, and telephone.

It was discovered in the year 1891, when Mr. Heffernan pegged out what was at the time called the Day Dawn Reef, and which is now the well-known Great Fingall Mine.

Little alluvial gold was discovered in this district, and the few small patches that were worked were situated close to the caps of reefs to which their enrichment could be directly traced.

The well-defined reef outcrops in which rich patches of dollying stone were discovered, quickly attracted the attention of syndicate promoters who acquired them mostly in the first instance for South Australian Companies, but later on many passed into the hands of English Companies, most of whom have now ceased to exist.

The town of Day Dawn itself lies immediately to the northward of the Great Fingall Mine, upon the large alluvial flat which constitutes the main drainage channel from Cue to Lake Austin; it is therefore continually liable to flooding, it being by no means an uncommon thing for the main street to be transformed into a river whilst sometimes after very heavy rains it is even covered to a depth of from 2 to 3 feet.

This main valley is flanked upon either side by a low range of hills, that to the westward being by far the highest and extremely rough; it attains its maximum altitude near its south end in the Trenton Hill which is 1,600 feet above the sea level and 230 feet above the adjoining flats. Upon the south side of the main valley the ridge is neither so steep, high or rough, and consists of a series of low spurs from between which subsidiary drainage channels emerge and join the main one.

It will be needless to here traverse the same ground as that already covered by the Cue section of this Bulletin with regard to firewood and timber, as the conditions are identical as also may be considered the rainfall, whilst the water supply for domestic purposes is obtained from the same service, supplemented however by a number of fresh water wells of better quality situated upon the ridge to the eastward of the town.

As at Cuddingwarra, the water level of this district appears to have risen during the last 15 years if any reliance is to be placed upon official records, for in several instances shallow levels in the mines which Mr. Goezel mentions as being above the water level are now below it.

The water as a rule is fresh near the surface, but becomes salt with depth, a very large supply being encountered along the main valley, which is probably due to its position upon a main fissure line.

Table showing the Annual Production of the Day Dawn District.

Year.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.
	Fine Ozs.	Fine Ozs.	Tons (2,240lbs.)	Fine Ozs.	Fine Ozs.
Previous to 1897	..	130.18	51,465.00	53,013.35	[illegible]
1897	..	561.42	13,126.00	14,606.84	15,168.2
1898	..	43.54	11,556.10	12,206.10	12,249.6
1899	55.31	868.53	5,978.50	10,408.02	11,331.8
1900	3.39	127.34	8,101.00	12,283.14	12,413.8
1901	11.29	161.70	43,151.50	57,694.96	57,867.9
1902	..	35.45	81,731.00	101,995.35	102,030.8
1903	5.93	338.40	106,502.75	136,424.35	136,768.6
1904	665.94	186.29	146,477.00	160,311.28	161,163.5
1905	49.04	130.74	184,627.25	161,327.50	161,507.2
1906	184.46	155.43	226,011.00	123,707.69	124,047.5
	975.36	2,739.02	878,727.10	843,978.58	847,692.9

DESCRIPTIVE GEOLOGY.

The geology of the Day Dawn District differs very materially from that of Cue in that the grano-diorite which is so largely developed in the latter is entirely absent here, the belt which it occupies lying a few miles to the westward. The whole area may therefore be classed as greenstone, with its schistose and altered forms due to hydration and attendant forces, such as compression, elongation, crushing, buckling, and shearing. The term greenstone has been selected as the most applicable to these rocks as a whole, because it possesses so wide a significance and in consequence includes not only the normal hornblende schists, amphibolites, etc., but also the diorites, diabases, and andesites, all of which rocks occur in this district, but since they are, as a rule, so highly altered at the surface it is absolutely impossible to delineate their boundaries with that degree of accuracy which could be desired.

Of the area under review, the amphibolites with their altered forms consisting of chloritic schist, etc., occupy all the eastern and southern portion, it also underlies the large alluvial flat, whilst the diorites and epidiorites occupy the north-western portion forming the rough hill ridge which extends in a south-easterly direction from the hospital reserve at Cue to the Trenton Hill. This latter appears to be a magmatic igneous intrusion most probably of diabase, the augite of which has been changed into hornblende and epidote.

The amphibolites are highly foliated and hydrated near the surface, the cleavage planes lying in a generally north and south direction with a slight trend to the eastward. Exceptions to this are met with principally in the contact zone where they may vary considerably owing to local shearing.

These rocks are usually highly altered near the surface where they are often represented by brown greasy clay schists which pass into chlorite schist and so on into hornblende rock below the water level.

The igneous series are usually massive at the surface, exhibiting little foliation and where it is present it is due either to the shearing action produced by faulting or to hydration along the contact zone.

The andesites are clearly recognised at two localities; in the first, as at Cue. They occur as a flow, capping the highest hill and its immediate spurs; being often vesicular and sometimes amygdaloidal. No neck has yet been discovered, but in sinking a shaft upon the Creme d'Or reef, which is situated immediately to the eastward of the Railway Station, a dyke of augite andesite was passed through, therefore it is possible the denuded vents may be hidden beneath the alluvium of the flats.

No basic dykes were recognised in this district where, if they do exist, their weathered outcrops would present so similar an appearance to those of the amphibolites and epidiorites that they would not be noticed, but upon the other hand, the acidic porphyritic dykes are in considerable evidence, particularly around the Trenton Hill, where they penetrate the basic igneous series, being in all probability offshoots from the grano-diorites which lie to the westward.

In traversing this belt of massive rock these dykes, as might be expected, do not follow a uniform course, although their main trend is in a south-easterly direction. They are often of very considerable size, two of the largest being exposed at the south end of the rifle range upon the northern face of the Trenton Hill where they rise abruptly, presenting a precipitous face.

Lateritic deposits are of rare occurrence in this district, the only localities where they are met with, being upon one small ironstone hill on the road to Cuddingwarra, and a thin covering of the same material in a detrital form upon the hills to the eastward of the town.

Alluvial deposits consisting of fine brown loam and clays cover all the flats, but these are of no great thickness and of no economic value except for brick making.

The lodes in every instance in this district are of the normal type of quartz reef, presenting the usual characteristics of zonal enrichment, which may either occur as a well defined shoot following the folds in the plane of the fissure or as patches near the surface of great richness but of limited extent.

These lodes for the most part lie in a series of more or less parallel lines along the centre of the area, having with one or two exceptions a general northerly course with a dip to the westward or following the cleavage planes of the schist (the fissure planes or planes of greatest weakness being coincident with the foliation), thus giving them the appearance of bedded veins.

They are of that type which has been badly distinguished by the extremely vague and inappropriate designation of true fissure veins, which term, strictly speaking, embraces all classes of fissure lodes, therefore the term of faulted fissure is much more applicable to them as indicating that a differential movement has either taken place between the walls themselves or between one or even both, and the lode matter.

The fissures in this district are for the most part either faults or shearing planes, although instances of both joint and fissility veins also occur, but in most cases however they are probably fault fissures owing to their great longitudinal extent and the indications of grinding met with upon the wall. These fissures, which allowed the circulating of underground waters charged with mineral matter to deposit silica layer by layer upon their walls, appear to have opened gradually owing either to the shrinkage of the adjoining rocks or by the sliding of the irregular walls before referred to by which, when concave surface was opposed to concave more or less lenticular-shaped spaces or pipes would be formed through which the depositing solutions could flow with greater ease. That these fissures opened gradually is proved by the presence of rock masses (called horses) enclosed in the lode matter, for had the fissure been suddenly opened to their full extent these detached rocks would have fallen until they became jammed between the walls at a narrow point and would therefore be in touch with both sides, whereas they are generally entirely surrounded by quartz thus proving that they become detached from one of the walls by a dislocating force after the other side had been cemented to the opposite wall.

In some instances these fissures have been expanded by the bending or buckling of the rocks due to elongation, and it is at these points that quartz bodies usually attain their maximum dimensions.

Many quartz reefs in the district are found to have well-defined outcrops traceable at the surface for a considerable distance, whilst upon development at lower levels they are often found to consist of a series of lenticular masses; in other cases there are isolated outcrops following a general line of strike and these latter may possibly be found to be one continuous body at a depth; in either instance however their formation is due to the unequal opening of the fissure. This question of continuity of line is usually considered to be of great importance, particularly if by any stretch of imagination it can be claimed that a reef is upon the same line as a rich mine. In reality however, the only point of value in continuous fissures is that the greater their longitudinal extent the more prospect there is of their living downwards. When, however, it is a question of values the length of a fissure is of little consequence, for although it may be undoubtedly proved that a series of quartz bodies occupy the same fissure, one of which is rich, it is in this State most generally found that the others are poor or barren since the gold is usually localised in lodes in the form of bunches or pipe-like portions called shoots, the deposition of which is governed by some law which has not yet been discovered.

The lodes of this district may be divided into three groups, 1st, those of the igneous zone, 2nd, those of the contact zone, and 3rd, those of the amphibolite zone.

In the igneous area the reefs appear to occupy faulted fissures which have a general trend north and south with a dip to the westward; they often bifurcate and are not so regular in their course as those met with in the more foliated country, neither are the quartz bodies of such length although the fissures may be of considerable extent. The returns from 22 leases worked in this region show a total of 6,389.84 ounces of fine gold, being .82 per cent. of the production of the district, therefore so far this has not proved to be a very productive zone.

No mine in this area has yet proved to carry payable stone much below the water level (about 100 feet), but since with the exception of the Rubicon, little work has been done below it, the question as to whether this is a general rule has not been conclusively demonstrated.

In the Rubicon mine, a zone of enrichment was worked from the surface down at and near a point where the reef bifurcates to a vertical depth of 144 feet, below which although the lode has been followed to a depth of 900 feet and driven on for a considerable length both north and south no further payable stone has been cut.

The fissure in this mine is of considerable width, the whole being sometimes occupied by crushed rock material called formation which in places contains strings, veins, and bunches of quartz, or the whole channel may be filled with that material. The walls of this lode are sometimes highly polished and striated, whilst at others they are ragged, but judging from its general character it is evidently a fault fissure, and therefore the vein may continue to a considerable depth.

The richest reef in this line is the Crœsus, which from 1,138 tons of stone yielded 1,640 ounces of fine gold, this being apparently exclusive of the sands treatment of which there is no record. All this stone was raised from above the 100 foot (water) level, but as the mine has not been worked since 1899 it is inaccessible, and in consequence the character of the lode cannot be described.

A number of reefs from which small returns have been obtained lie south of the last-mentioned, also to the westward of the Trenton Hill, whilst at the south-west corner of the map in the Mount Fingall, late Strathmore, there appears to be a fissure of considerable promise.

The second group occupying the contact zone contains all the principal productive mines of the district, but strange to say there are only eight gold-bearing reefs in it, these, however, or more correctly three of them, have produced 97.60 per cent. of the total yield of the district.

These reefs, generally speaking, have a more decidedly north-westerly course than the last group and underlay to the south-west, the exceptions being the Day Dawn West and the White Horse, which appear to be joint fissures with a strike to the north-east and dip to the south-east. All the lodes in this as in the other groups appear to follow the cleavage plains of the schists, but since there is a very considerable variation in their course even when in close proximity, this foliation in some instances must be local and due to the shearing action which has taken place parallel to the fissure planes.

There is one point worthy of note with regard to the zone of greatest enrichment in this group of mines, which is that it occurs in the reefs at a point which varies from 10 to 15 chains distant from the boundary of the igneous rocks, whilst in the reefs having a normal course the shoot dips towards them.

Two reefs belonging to this series, viz., the Great Fingall and the Golden Crown, can be traced at the surface penetrating the igneous zone in which they either bifurcate or follow an irregular course. This is clearly seen at the north end of the Great Fingall where a split occurs in the vein, one branch maintaining the general course in an irregular manner whilst the other first turns sharply to the northward along the contact for a short distance and then strikes off the igneous region. This bifurcation is also met with in each succeeding level in this mine beyond which point the course of the vein is generally irregular ; it carries low values for a distance and then generally pinches out. Although the parallel foliation of the rocks due to shearing are apparently continuous along the fissure a change in their nature may be observed, particularly near the contact where they become graphitic.

It is probable that the bulges which often occur in this series of reefs are due to a certain amount of buckling which has taken place in this area due to pressure being exercised upon the ends of the foliated rocks.

The third group which are situated in the amphibolite area is of the usual normal type possessing a general northerly strike and westerly dip, and although the statistics show that the return from 22 leases amount only to 1.26 per cent. of the total production of the district it is quite possible that some of these may develop into good mines.

There are only two mines in this group upon which what can be called development has taken place, these being the East Fingall and the Kinsella, the former of which has cut the Eureka No. 5 at the 500-feet level. This point is of very great importance as demonstrating clearly that these reefs although they may lose values at points in their descent still recover again and contain bodies of payable ore at depths considerably below the water level which was previously supposed to be their limit.

To the southward of the East Fingall, a certain amount of local disturbance has taken place which is possibly due to the intrusion of andesite dykes, one of which was met with in the Creme d' Or mine.

The Kinsella which lies farther to the south-east has a north-easterly course and dips to the south-eastward at a high angle : it is a well-defined fissure line, the lode being of great size in places, but it is generally speaking of low grade.

SECTION II.—THE MINES.

GENERAL.

This section is devoted to a more or less detailed description of the individual mines of this district, but in it notice has only been taken of those which have been productive.

Upon the whole a very inconsiderable amount of work has been done upon the majority, only about ten being in any way entitled to be called mines since development has been confined for the most part to the wholesale removal of stone above the water level.

Out of those which may be classed as mines, only two are completely equipped, and only one at the present time, viz., the Great Fingall, is worked at a profit, whilst this latter is worked upon so large a scale as to cast a very considerable shadow over the joint production from all other sources.

It naturally follows that the name "Fingall' in some form is very popular, whilst reefs at distant points and in impossible positions are described as being the continuation of the famous lode. Unfortunately, so far we have only one Great Fingall in the district, but when the fact is borne in mind that this was once only the Day Dawn mine with a very limited, and later on worked out, shoot of stone, and that the existing ore body was only discovered through the enterprise of the present company, it follows that in a district where so little solid prospecting has as yet been undertaken, it is quite possible for other bodies of equal or even greater value to lie hidden beneath the surface.

The following is a table compiled from official sources giving the amount of stone crushed with the gold therefrom in fine ounces, as reported to the Mines Department by each company or party holding the various areas, from which it will be seen that the stone from this district has averaged 0.92 ozs. per ton.

The difficulties and high cost of working here on account of the scarcity of timber and fuel being the same as at Cue, referred to in Part I., it will not be repeated here.

Table showing the Production of the Leases in the Da District.

Name of Lease.	Number of Lease.	Ore Crushed.	Gold the from.
		Tons.	Ozs.
Ada Mary	278D	66.00	34.
Aurifer	253D	11.00	2.
Bonnie Scotland	215D	6.50	13.
Caledonia	350D	..	12.5
Cooya	28D	85.00	51.
Creme d'Or	389D	398.00	300.
Crœsus	14	1,138.00	1,640.
Cue Mining and Exploration Co., Ltd.	233D etc.	2,064.00	635.1
Day Dawn	398D	90.00	258.5
East Fingall	264D	1,208.00	709.1
Edward VII.	214D	30.00	88.3
Emperor	176D	1,849.70	2,874.7
Eureka No. 5	26D	1,280.25	1,292.4
Fingall	239D	50.00	22.1
Golden Crown	78D	110.00	130.5
Great Fingall Associated	332D	30.00	4.0
Great Fingall Consolidated, Ltd.	1D etc.	804,851.00	749,456.5
Great Western	125D	43.00	25.9
Groper	156D	172.00	158.7
Ironclad	413D	47.00	4.3
Ironclad North	412D	50.00	36.2
Ivy Mary	327D	23.00	1.3
King Edward VII.	322D	54.00	42.1
Kinsella	149D	10,801.00	4,348.9
Klondyke	312D	93.50	31.5
Klondyke	293D	98.00	42.2
Last Chance	369D	111.00	41.9
Mikado	179D	28.50	19.5
Mount Fingall	273D	1,809.00	1,042.7
Murchison Associated Gold Mines, Ltd.	138D etc.	3,503.50	2,216.6
New Ballarat	394D	124.00	116.9
New Caledonia	157D	155.00	85.9
New Fingall	331D	17.00	9.5
Nimrod	M.L. 1	30.00	37.3
Pelican	101D	25.00	26.5
Perseverance	46D	48.50	35.0
Phœnix	173D	40.00	607.7
Queen's Birthday	66D	33.00	7.3
Revenue	282D	20.00	3.7
Richmond	151D	70.00	182.7
Royal Charter	181D	317.00	322.04
Sailor Lad	134D	48.00	53.59
Smith's United	146D	162.00	261.24
Southdown	115D	429.00	636.74
St. Albans	119D	43.00	15.33
Strathmore	163D	47.00	26.73
Trenton	148D	8,746.10	6,197.98
Try Again	267D	49.25	79.61
Welcome	307D	50.00	28.43
West Fingall, No. 6	119D	43.00	15.32
White Horse	268D	5.00	5.14
Yalgoo Proprietary Prospecting Syndicate, Ltd.	12D	720.00	806.22
Sundry Claims	..	588.25	725.08
Day Dawn South Battery	3D	380.00	505.50
Cue Victory Battery	..	..	21.50
Day Dawn Public Battery	M.A. 6D	125.00	1,049.22
Emperor Battery	..	30.25	15.77
Eureka No. 5 Battery	..	264.50	128.67
	..	844,023.05	778,606.20

DESCRIPTION OF THE MINES.

The Great Fingall Consolidated, Ltd.—This property, which is situated upon a spur on the western side of the large alluvial flat immediately adjoining the southern boundary of the town of Day Dawn, consists of a large group of leases, amongst which are embraced the old Day Dawn, the Day Dawn North, the Day Dawn South mines, now worked as the Great Fingall; also the Day Dawn West, the Pelican, the Golden Crown, the St. Albans, and the Smith's United Mines (at present idle), which, together with a number of other leases are held for block or area purposes. (Photo. 1.)

At the present time only the principal mine is being worked, this is the original Day Dawn, which gave its name to the town; it was discovered in the year 1891 by Mr. Heffernan, but later on passed into the hands of the Consolidated Murchison Gold Mines, Ltd., by whom it was worked until 1899, when the abandonment of the mine was seriously meditated ; fortunately, however, the Great Fingall Company, which was strong financially, decided to give it a further trial, and the result of this enterprise was rewarded by the discovery of a large and rich shoot of gold from the proceeds of which they have been enabled to pay their shareholders close upon one and a-half million pounds in dividends, to equip the mine with a thoroughly up-to-date plant and to acquire property of considerable value.

Up to the end of the year 1906, this mine, exclusive of the West Day Dawn (the returns from which mine are included in the official statistics), produced 795,077 tons of stone, which yielded 742,612.95 ounces of fine gold, or at the rate of 0.93 ounces per ton, being 95.38 per cent. of the total gold production of the district.

As previously stated, the lode lies within, or more correctly speaking crosses, the contact zone, its course starting from the south end, being first west-north-west, then north-west, and then north-north-west until it bifurcates when the western branch follows a course a little west of north, and the eastern, after first taking a sharp turn to the north-east for a short distance assumes a nearly north and south course with a slight inclination to the eastward at the north end.

This reef, which has an outcrop of about 30 chains in length, was of considerable size at the surface and rose above the level in a series of camel-backed ridges from 10 to 20 feet in height. The first at the south end rises from the alluvial flat and was originally held as the Day Dawn South; the next or main outcrop from a low schistose slope was the Day Dawn, whilst a long ridge with two slightly higher points was the Day Dawn North.

Beyond the point where the reef splits, which was originally known as the Union Jack, the character of the outcropping rock changes, the surface being strewn with pieces of rock of a more massive character into which the western spur penetrates and can be seen at the surface for a distance of about 10 chains, whilst the eastern, after it has assumed a northerly course, outcrops as a bold ridge for some distance, but gradually becomes less conspicuous until it can only be traced by strewn quartz boulders, the total length of this branch being about 20 chains, after which all indication of it is lost. It is quite possible, however, that this is a main fissure line extending northward, but on account of it not containing quartz it cannot be followed at the surface.

The south end of the main lode rises abruptly out of the alluvium, consequently the southward extension of the reef is not visible in this direction, but the fissure most probably swings round on to a more southerly course, following the main foliation of the rocks. A considerable amount of boring has been done some twenty chains farther south, but no prospecting has been done from the surface at the point of disappearance in order to test this question.

The average dip of the vein is 60 degrees, and the general character of the outcropping quartz is a dense blue grey or blackish banded stone showing traces of the presence of pyrites by lines of red iron oxide, whilst the enclosing country varies from a brownish highly-weathered schist to chloritic schist and epidote rock, which, as before stated, at the northern end it is replaced by a massive hornblende rock.

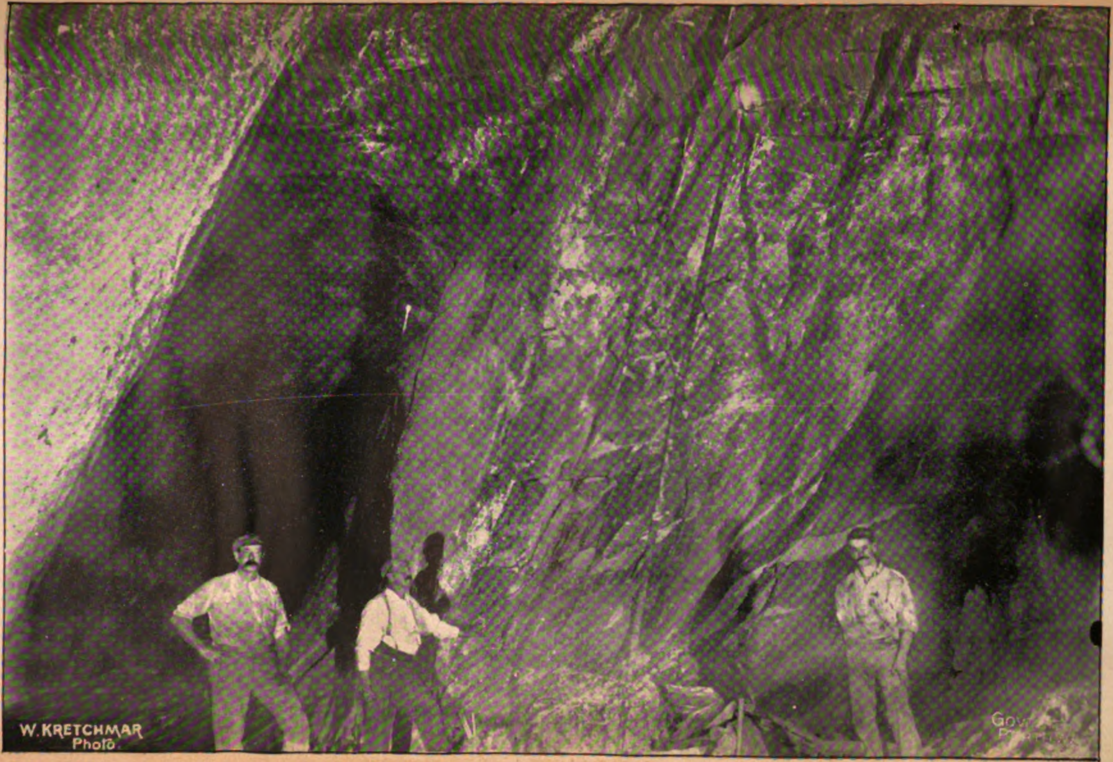
In the under workings the reef has not that continuity in a northward direction which is apparent at the surface, although to judge from the plan it must have been fairly so in the No. 1 level (not accessible), whilst a branch drive to the northward appears to indicate that the eastern arm was followed for a short distance in that direction.

Below the No. 1 level little northward exploitation has taken place until the No. 7 was reached, in which the reef was followed northward on a strong and rich quartz body from the crosscut to Armstrong's shaft for a distance of 300 feet, just beyond which point it is suddenly lost. More recently, however, when the eastern or footwall branch of the reef was risen on from the levels below it proved to exist upon the western side of the drive.

This level has recently been extended for a distance of over 1,000 feet, or to beneath the old Union Jack workings, in schistose country, and therefore along the line of fissure with quartz veins here and there sometimes for a considerable distance, but of small size and low value.

From this level about 500 feet of cross-cutting has been done, in which several veins of quartz were cut, but which proved to be of little value; in the crosscut at the north end a good sized body of stone has been cut, which is clearly the eastern branch of the lode, as it corresponds in position, etc., with the vein prospected in the 300-feet levels above from the Union Jack shaft.

In the next three levels at a position below the point where the reef was lost in the No. 7, the vein splits, but this was not at first discovered, as no quartz followed the eastern or footwall branch at



Horse in Lode.

the point of bifurcation. Some 200 feet farther on in the No. 9, a vein united with it upon the footwall side, which was then followed back to the point at which the lode split, thus enclosing a large horse of country.

In the Nos. 8 and 10 levels this has not been traced round, as the quartz was of too low a grade to be considered worth following. In the levels below this the reef bifurcates, but both branches become small and of low value in this direction.

Towards the ends of these levels a crushed rock consisting largely of graphite and chlorite is often met with, which appears to indicate the contact line between the schists and the diabasic rock; little change, however, can be noticed in the rocks themselves, since the levels have followed the fissure, along which they have been altered and foliated in planes parallel to it, the best indication of the change of country being found in the character of the fissure itself, which from the surface downwards to the lowest levels splits at the northern end of the shoot, and from this point onwards assumes the character peculiar to a vein in massive rock.

At the south end of the various levels the reef becomes small and gradually pinches out, but with the exception of the No. 5 level practically no prospecting has been carried on in this direction; in this level, however, the drive has been extended to about 600 feet beyond the point where the vein was lost, which is a little beyond the No. 10 rise.

Near this point a well defined fissure, from which a considerable quantity of water is emitted, may be noticed striking off to the southward, after passing which the country becomes dry, and the rocks more magnesian in character, whilst their cleavage planes cross the drive at an angle from which it is apparent that the fissure has been lost, it having turned off to the southward at the point from which the water flowed.

At a point a little below the No. 5 level near Armstrong's shaft the lode is joined diagonally by a spur upon the footwall side which is called the New Reef and proved to carry good values for a length of 150 feet, whilst the main reef which was almost barren above the union became very rich below it.

This is a point to which very considerable interest attaches in this mine owing to the fact that the shoot of gold worked by the original Company, which was the only one that outcropped at the surface, terminated at a vertical depth of about 150 feet, thus leaving 100 to 150 feet of nearly barren ground between it and the top of the main shoot.

Below the surface this lode presents all the characteristics of a faulted fissure, being possessed of good walls which at many points are polished and striated, being often separated from the adjacent country rock by a layer of clay, thus clearly demonstrating that considerable movement with accompanying grinding action has taken place. In places large masses of the rock have become detached and subsequently enclosed in lode matter thus forming horses (Photo. 2) whilst at other points vugs or cavities lined witl crystals are also met with in the vein itself.

Below the water level, which is about 150 feet in vertical deptl from the surface, the reef becomes mineralised containing smal quantities of pyrites, pyrotite, arsenical pyrites, blend, galena and copper.

The reef has a very uniform dip of 60 degrees to the south-westward and is generally of considerable thickness, bulging for a considerable length in the main shoot to a width of from 30 to 40 feet; at the ends however, it pinches away to mere stringers and threads beyond which nothing but the fissure line remains. This great swelling in the width of the fissure is in all probability due to the buckling of rocks owing to longitudinal pressure.

The pay ore in this mine occurs in limited but defined sections or shoots of considerable size separated by zones of poorer or barren ground. These shoots do not follow the fissure plane down upon its full dip but traverse it diagonally more to the northward; they occur at those points where the vein attains its maximum proportion. The main shoot varies from 6 to 40 feet in thickness with an average width of 600 feet, and has a proved continuous downwards extension from the No. 4 to the No. 13 level, or a length upon the lode plane of 1,500 feet.

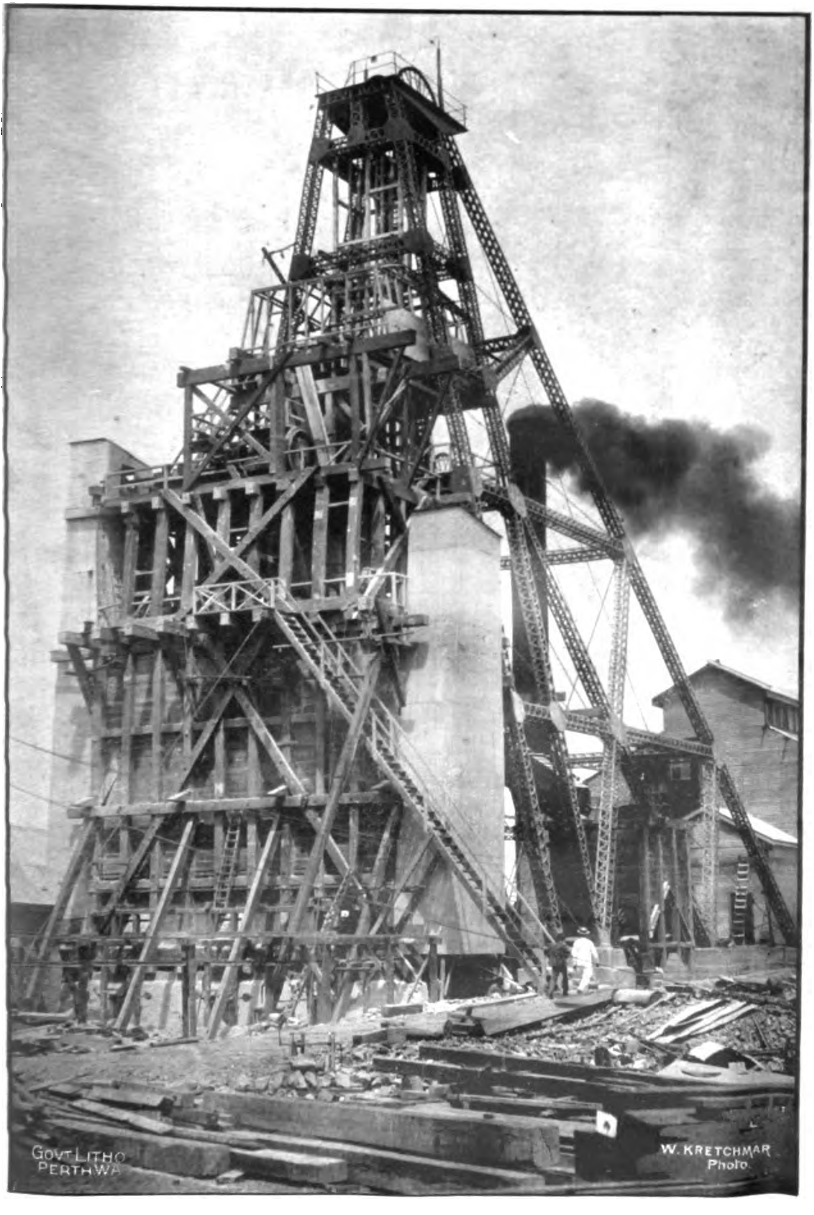
Besides the main shoot there is a second one farther south which has been stoped from the No. 5 to the No. 10 level for an average width of about 300 feet, it is neither so large nor so rich as the last mentioned from which it is divided by a poorer zone about 150 feet in width, but a good deal of this will probably be worked.

The original or surface patch of enrichment upon which this mine was started proved to be of very limited extent, its outcrop being 250 feet in length, whilst it only extended for a depth of 200 feet upon the lode plane, gradually diminishing in length to about 100 feet at the bottom.

The values in the ore channel were highest near the junction with the spur reef, from which point they gradually decreased downwards, but fortunately the latest reports convey the welcome information that they have very greatly improved at the bottom level.

In no mine up to the present time has a zone of enrichment been known to carry its values to an indefinite depth, but they usually occur in a more or less lenticular form one below the other, therefore when we consider the fact that payable ore in this mine has been proved to extend for a length of 1,500 feet in one continuous shoot a fluctuation in value was certain to occur.

The laws which govern this zonal enrichment have not as yet been discovered, but local enrichment can in most instances be accounted for. In the case of this mine its enrichment is evidently due to its position with regard to the contact of two formations, but the question as to whether another zone of increased values will be



Day Dawn Shaft.

met with below the one already worked, and being worked, cannot be answered owing to our limited knowledge.

It may be mentioned here that the character and occurrence of ore bodies in crystalline rock have not been so fully studied as those in the metamorphic and sedimentary series, owing to their much rarer occurrence, but in this case the improved values at the bottom level appear to indicate the occurrence of a second zone of enrichment.

Shafts.—This mine was originally developed from what is known as Armstrong's shaft, which is a vertical three compartment shaft measuring 10 feet by 4 feet inside the timber and 675 feet in depth. It passed through the lode between the Nos. 4 and 5 levels, but upon reaching the No. 8 level a crosscut had to be driven a distance of 200 feet to the reef, therefore a second main shaft called the Day Dawn shaft, measuring 15 feet by 5 feet inside the timbers was sunk further to the dip to a vertical depth of 1,250 feet, or between the Nos. 11 and 12 levels, at which point it cut the lode.

From this point the shaft was carried down upon the incline at first in the lode, but as this assumed a steeper dip below the No. 12 level a uniform grade was continued, and in consequence a crosscut had to be driven for a distance of 25 feet to connect with the lode at No. 13 level which is at a vertical depth of 1,500 feet.

In the vertical portion this shaft contains four compartments, two being skip roads for rapid haulage of the ore, and these two are continued upon the underlay, one cage or travelling way, which terminates at the bottom of the vertical section so far as the cage is concerned but continues as a ladder and a pipe way to the bottom level, whilst the fourth compartment, which is used for lowering pipes, timber, etc., terminates at the bottom of the vertical section.

All shaft sinking upon this mine is carried out by contract. The Day Dawn shaft, which is 17 feet by 7 feet 6 inches in the clear, cost £9 10s. per foot, the Company finding power, machines, timber, haulage and tool sharpening, the contractor only supplying labour and explosives. (Photo. 3.)

Above this shaft 110 feet steel head gear has been erected, the haulage being done by a first motion winding engine by Douglas and Grant, 22-inch cylinders by 36-inch stroke and 6-feet drums, whilst at the Armstrong's shaft there are a pair of direct motion engines by Martin, of Gawler, 13-inch cylinders by 24-inch stroke and 4½ feet drums. There are also three geared winches driven by air underground.

Driving and Crosscutting.—The lode is worked by a series of levels connected with the shaft by crosscuts, those above the No. 9 average rather under 100 feet apart, whilst those below average 200 feet. The dimensions of the drives are 8 feet by 8 feet, and exploratory crosscuts 7 feet by 5 feet, but the main levels upon the lode vary with the width of the ore body and the crosscuts connecting the shafts with levels are never under 8 feet by 8 feet.

As in the case of shaft sinking, this work is carried out by contract at the rate of £3 per foot by contract and under the same conditions, viz., the contractor only finds labour and explosives.

The ore body is exploited in depth by winzes, which are sunk from the lowest level in the mine, these being eventually connected with the shaft at their bottoms by the next level.

Two methods of timbering levels in the ore channel and opening stopes have been adopted in this mine, the first of which was employed in the upper portions of the mine when the ore was of high grade, therefore it did not pay to leave any of the stone behind: this was to secure the levels by the means of stulls and lagging (see Photo. 4) packed with refuse from the stopes, which latter were carried up from the back of the level, the ore being delivered into the trucks by shoots from the passes, the spaces between the latter being filled with refuse and later on with tailings.

In the lower levels where the ore is not of such high grade the ground is secured by cap pieces supported by two or more legs according to the width of the lode (Photo 5) whilst a portion of the vein is left intact immediately above the level. The stopes are opened from a series of passes which are carried up for a short distance through the solid ore above the level, they are then opened out in a fan-like shape until the wings join those from the next ones, thus forming wedge-shaped divisions with the points upwards, which guide the descending broken ore from the stopes above into the passes and shoots (Figure 1.)

The stopes are then carried up and the broken ore drawn from shoots as required, and as the stopes are usually allowed to remain nearly full during the process of breaking down men are in little danger of falls as they can stand whilst at work upon the broken ore ; it also has the advantage of economy since no timber is required and no handling to the passes.

All development in this mine is done with rock drills of the air valve type, mostly 2¾-inch to 3½-inch cylinders, but there are also some one-man drills of the same type, 2-inch to 2½-inch cylinders, there being a total of 32 machines employed upon this work.

The stopes are filled as far as practicable with rock from exploitation and development work, also with the refuse from the stopes themselves whilst the balance is made up of sands.

The ore is discharged from the shoots into trucks in the level and wheeled to the shaft where it is tipped into the ore bins after passing through coarse timber screens upon which pieces too large to pass are broken, whilst from these bins which are below the level the ore is drawn off into the skips and hauled to the surface.

The item of timber is a very large one on account of the great distance from which it has to be obtained, the average cost for the last six months amounting to £333 15s. 8d. per month.

Water Supply.—The water level in this mine is said to be 150 feet, but no reliable information is available as to at what level the

Fig. 1.

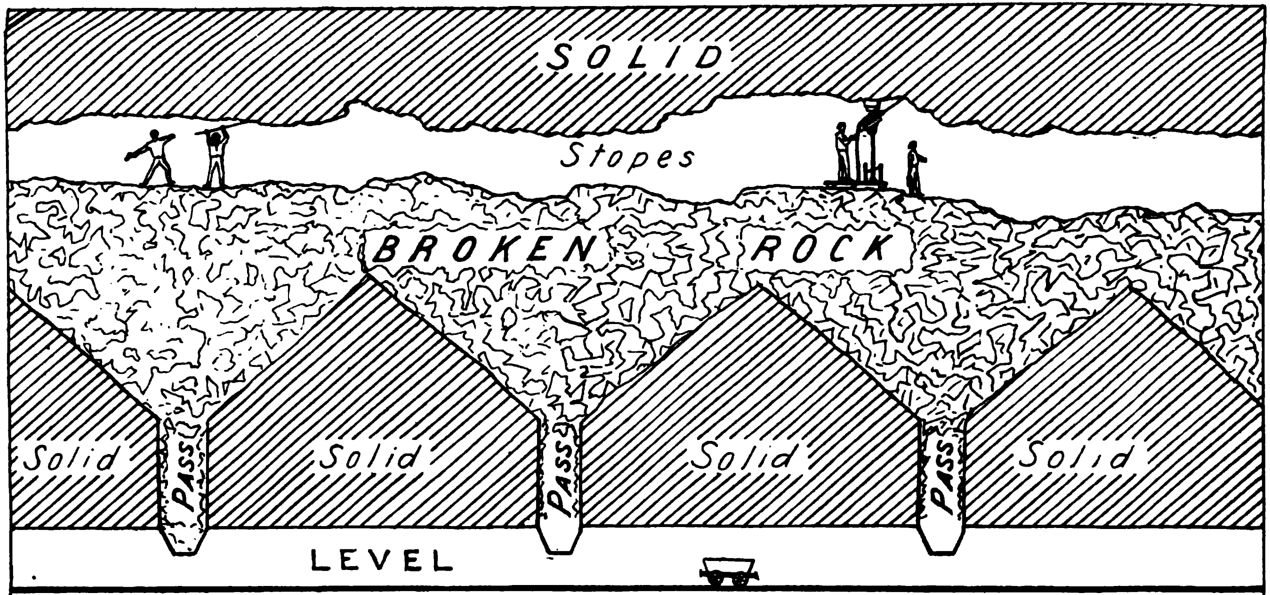


DIAGRAM
TO ILLUSTRATE SYSTEM OF OPENING STOPES

C.B. Kingson del

ground water stood before pumping was started, but it would probably be much closer to the surface. Below the water level is a zone of from 150 to 200 feet of saturation beneath which the country rock is completely dry, all the water encountered being due to seapage from the upper levels.

The water, which is highly mineralised and salt, amounting to 30,000 gallons per diem, is drained to the Armstrong shaft, from which it is raised to the surface by a 9-inch Cornish lift, whilst the seapage from the lower workings is raised to it by air pumps.

The *ventilation* is for the most part produced by natural circulation, but in dead ends, rises, etc., it is augmented by compressed air.

The *illumination* of the mine is afforded by electric lights on the plats and at the ore bins ; elsewhere kerosene and candles are employed.

As 70,000 gallons of salt water are consumed daily upon these works and as the mine only yields 30,000 gallons or less than one-half, this has to be made up from various neighbouring shafts, but fortunately for this company, the East Fingall encountered a very considerable supply in sinking, which being allowed to run to waste on the Great Fingall leases is impounded.

About two-thirds of the fresh water supply for boiler purposes, etc., is obtained from three shafts upon the company's leases and the balance from the Cue and Day Dawn Water Supply. It will be seen that this item must also be a heavy one since it entails considerable pumping from different points outside the unwatering of the workings.

Surface.—Upon the surface a very complete up-to-date plant including extensive workshops in which even large castings can be turned out, thus effecting a very considerable saving both in expense and loss of time, the only fault that can be found with it from an economic point of view is want of concentration owing to the fact that as originally planned it was not proposed to work upon so extensive a scale.

The ore is delivered from skips into grizzleys, from these into rock breakers and so into ore bins upon the head gear, from which it is conveyed by aerial tramway to the 60-head mill and by belt to the 40-head when after passing over the tables the sulphides are withdrawn and roasted, whilst the sands and slimes are separated and directly cyanided, the slimes being run into settling reserves and the sands delivered by belt carriers to a dump which, being over 100 feet in height, forms a conspicuous landmark (Photos. 6 and 7).

Fuel.—This as well as the timber is a very serious item upon this mine, owing to the fact that the local supply in this district within a considerable radius has long since been cut out, and in consequence firewood costs 17s. 6d. per ton delivered at the boilers, whilst coal, which has to be used on account of the limited supply of the former, costs 19s. per ton at Geraldton, which is raised to

38s. 6d. by the addition of freight and handling. Of these upon the average 1,030 tons of coal and 1,374 tons of firewood are used per month; therefore should the coal seams which are being prospected at the Greenough crossing upon the railway line between Geraldton and Day Dawn turn out well, it will represent not only a nice little contract for the coal company, but will mean a reduction of at least 5s. per ton upon the fuel value, estimating it at two-thirds that of Newcastle coal.

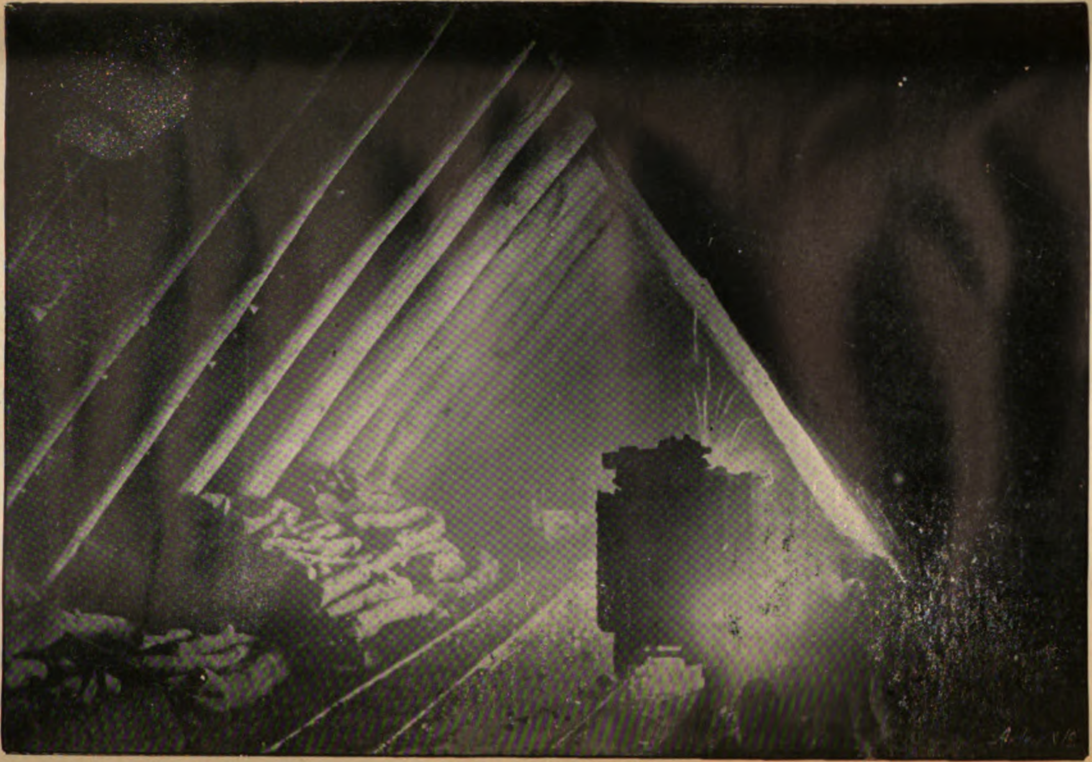
Freight.—During the past six years this has amounted to the very considerable sum of £83,469; this will seem almost incredible to many persons, therefore a table has been attached showing the rates upon the main items.

Statement of Railway Freights on Main Lines.

Item	Station Received from	Rate per ton	Remarks.
Coal	Geraldton ..	18/2	Including Wharfage 1/4 ton.
Bar Iron and Steel ..	Fremantle ..	60/1	
General Hardware ..	do	130/4	Bolts, Nails, etc.
Coke	do	45/2	
Candles	do	171/3	
Firewood	Allens	4/9	
Do	Nallan	1/5	
Do	Yowergabbi ..	5/1	
Do	Moyagee	1/9	
Round Timber	Carnamah ..	24/1	
Zinc Shavings	Fremantle ..	130/4	
Pig Iron	do	13/1	
Lime	9-mile Siding near Geraldton	17/7	
Cyanide	Geraldton ..	74/-	
Cement	Fremantle ..	45/2	
Jarrah	Cardiff, Collie ..	37/10	
Charcoal	Chidlow's Well ..	45/-	
Split Slabs	Parkerville ..	31/6	
Oregon	Fremantle ..	90/3	
Karri	do	32/-	
Gum Logs	Mullewa	15/9	
Quicksilver	Fremantle ..	211/11	
Wire Screening ..	do	171/3	
Machinery	do	90/2	5 ton lots.
Rails	do	45/1	
Pipes and Fittings ..	do	130/3	
Rock Drill Spares ..	Kalgoorlie ..	245/10	
Do	Fremantle ..	171/-	
Fodder	Geraldton ..	25/9	
Oils	Fremantle ..	130/2	4 ton lots.

Costs.—When everything is taken into consideration it seems wonderful at what a low cost this mine is worked, which according to the annual report for 1906 of Messrs. Bewick, Moreing, and Co.,

PHOTO. 4.



Timbering with Stulls.

the general managers, amounted to 19/11.02 per ton, equal to .23 ounces of fine gold or about 4.7 dwts.

Table showing the yield of the Great Fingall Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
Prior to—		Tons.	Ozs.	Ozs.
1897	Day Dawn G.M.L., 1D ..	23,744.00	12,243.03	.51
1897	Do.	2,338.00	1,671.35	.71
1898	Do.	3,696.00	3,128.73	.84
1899	Great Fingall No. 1 ..	330.00	2,832.12	8.58
1900	Do.	4,447.00	6,824.07	1.30
1901	Do.	39,984.00	53,595.66	1.34
1902	Do.	75,939.00	95,392.68	1.25
1903	Do.	98,200.00	129,278.22	1.31
1904	Do.	141,973.00	156,712.90	1.10
1905	Do.	181,534.00	159,774.97	.91
1906	Do.	222,892.00	121,163.20	.54
	Total	**795,077.00**	**742,616.93**	**.93**

Table showing the yield of the Day Dawn North Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
Prior to—		Tons.	Ozs.	Ozs.
1897	Day Dawn No. 1 North, G.M.L., 2D	..	..	..
1897	Do.	..	..	..
1898	Do.	1,018.00	629.59	.61
	Total	**1,018.00**	**629.59**	**.61**

The Great Fingall North G.M.L. 189D.—To the northward of the Great Fingall mine and in the northern block belonging to that company the reef splits, the main portion being deflected sharply to the north-eastward, then assuming a northerly course in which direction it presents a bold outcrop of bluish quartz, extending for a distance of 15 chains. The western branch, which would appear at the surface to follow the main line of fissure in a northerly direction, can only be traced at the surface for a distance of 10 chains.

A considerable amount of work has been done upon this north end of the reef, which was originally known as the Union Jack, but it would appear that the stone was of little value since no returns appear in the official statistics.

The Great Fingall Associated G.M.L. 194D.—About half a mile north of the Great Fingall is the Great Fingall Associated Mine, it was originally known as the Cooya up till 1897, when it was abandoned to be taken up again in 1901, and held for one year under the name of the Fingall, after which it was taken up by the present company.

There are two lines of reef upon G.M.L. 194D, which it is claimed are the northern extension of the Great Fingall lodes, but although undoubtedly upon the same belt of country, it would need a great stretch of imagination to say that this was a fact.

The main reef upon which the greater quantity of work has been done lies upon the western side of the property, having a nearly north and south course for a distance of seven chains, when it takes a more easterly course for three more chains, after which it is lost, the general direction of its dip being 55 degrees west. A main vertical shaft has been sunk to a depth of 205 feet, from which at a depth of 125 feet the reef was crosscut at a distance of 40 feet, and passed through at a depth of 165 feet, the water level being 78 feet.

A considerable amount of work has been done from an old underlay shaft upon the reef, which workings are now connected with the main shaft by the crosscut at the 125-feet level.

The country is hard amphibolite, except in the immediate proximity of the lode when it becomes more schistose.

Table showing the yield of the Great Fingall Associated Reef.

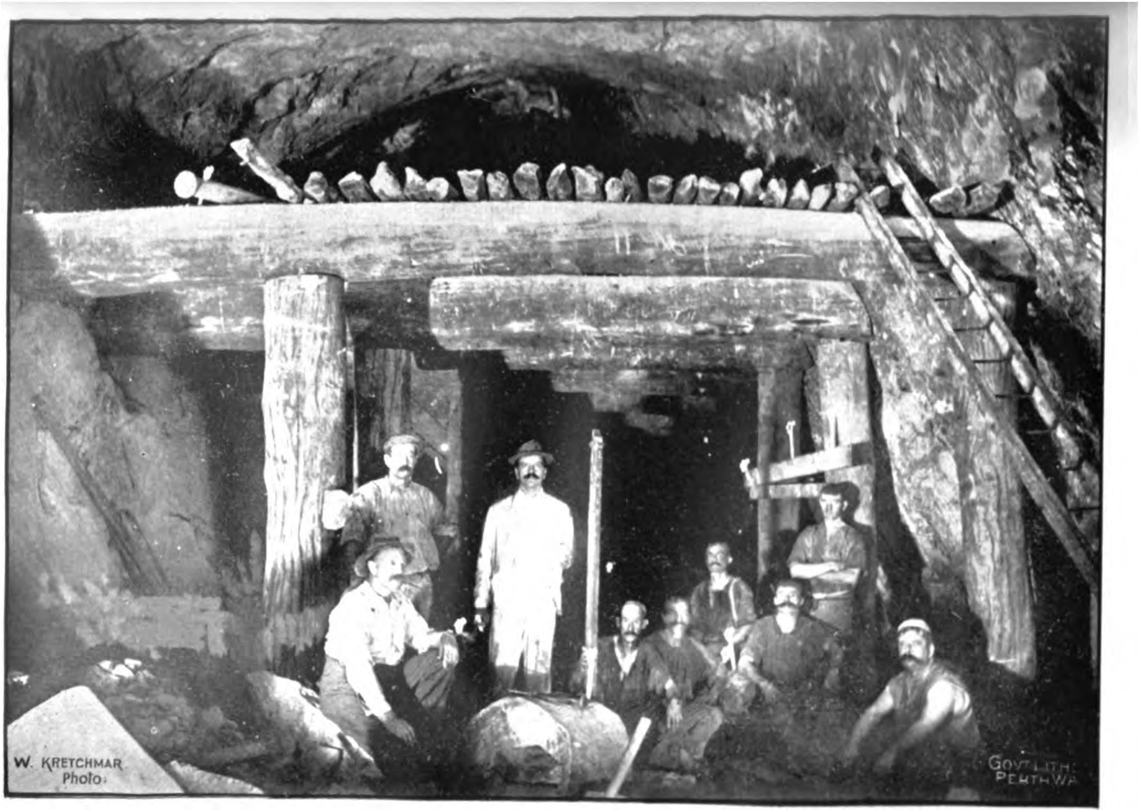
Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
Prior to—		Tons.	Ozs.	Ozs.
1897	Cooya G.M.L., 28D ..	50.00	36.67	.73
1897	Do.	35.00	14.74	.42
1901	Fingall G.M.L., 239D ..	50.00	22.17	.44
1906	Great Fingall Associated. No. 2 G.M.L., 332D	30.00	4.00	.13
	Total	**165.00**	**77.58**	**·47**

Sterns G.M.L. 237D (abandoned).—To the northward of the last-mentioned are a number of leases, which were originally known as Sterns No. 1, 2, 3, etc., but which in 1903 became the property of the Cue Mining and Exploration Company, Ltd., when they were worked in conjunction with a large number of other leases, and as a consequence no particulars are available as to the production from any individual lease.

The reefs on these leases are also supposed to be the northern extension of the Great Fingal lode, they have a north and south course and dip to the west.

A considerable amount of shallow work has been done upon these, but they are apparently of little value, otherwise they would not be idle as they are at present.

A diamond drill bore was put down by Capt. W. Hoskins to a depth of 550 feet, which passed through greenstone for its entire depth, sometimes intersected by small veins of quartz and calcite with pyrites, whilst below a depth of 529 feet the country became more schistose with numerous stringers of quartz and pyrites, but no values were cut.



Timbering with Legs and Caps.

Royal Charter G.M.L. 181D.—A little to the eastward of the last is the old mine, which was formerly known as the Groper, and later on as the Royal Charter. The reef here has a more or less north and south course with a dip to the west, but the southern end sweeps away round more to the south-east.

There are two shafts upon this reef which have been sunk to a depth of 60 and 70 feet respectively, they were also connected by a drive about 90 feet in length.

The shoot of gold was worked from an open cut a little to the northward of the north shaft, from which some very rich stone is said to have been taken. This shoot apparently dipped south since it was cut in the north shaft and later on in the level between which and the surface it has now been entirely stoped out.

Table showing the yield of the Royal Charter Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		Tons.	Ozs.	Ozs.
1898	Groper G.M.L., 156D ..	172.00	158.70	.92
1900	Royal Charter G.M.L. 181D	85.00	212.36	2.48
1901	Do.	30.00	9.76	.32
1903	Do.	32.00	20.19	.63
1904	Do.	29.00	14.83	.51
1905	Do.	72.00	49.50	.69
1906	Do.	69.00	15.04	.22
	Total	**489.00**	**480.74**	**·98**

The Rubicon G.M.L. 138D, *etc.*—A little to the northward of the Groper is the Rubicon mine, which became the property of the Murchison Associated Gold Mines, Ltd., in 1901, before which time it was privately owned.

The reef has a general strike of north and south with a dip that varies from 52 to 75 degrees to the west, it occurs in the main upper workings as two parallel bodies from 15 to 20 feet apart, which junction about 50 feet south of the main underlay shaft.

Of these the eastern is called the No. 1 lode, and the western the No. 2, but it is upon the former that by far the most work has been done.

The mine was originally worked from an underlay shaft, which was sunk from the surface to a vertical depth of 500 feet upon the footwall side of the No. 1 lode. From this shaft levels were driven first the No. 1 at a vertical depth of 90 feet for a distance north of 180 feet, and south 100 feet upon the No. 1 lode, and 25 feet north and 50 feet south upon the No. 2 lode.

The No. 2 level, which is at a vertical depth of 144 feet, was driven for a distance of 145 feet north and 30 feet south upon the No. 1 lode, and 130 feet north and 125 feet south upon the No. 2 lode.

The No. 3 level at a depth of 248 feet was driven 120 feet north and 110 feet south upon the No. 1 lode, whilst from the south end a crosscut was driven 15 feet west to the No. 2 lode, which was followed for a distance of 135 feet south.

The No. 4 level is at a vertical depth of 310 feet, and has been driven 245 feet north and 220 feet south on the No. 1 lode, whilst the No. 2 lode has only been touched by a crosscut.

In these upper workings, the No. 1 lode varied from 5 to 6 feet in thickness, and the No. 2 from 5 to 12 feet, the stone being of a bluish tint. No driving was done from the No. 5 plat, but at the No. 6, which is the bottom of the underlay shaft, it is connected with the main vertical shaft at a depth of 500 feet by a crosscut 200 feet in length, whilst the level upon the lode has been driven for a distance of 110 feet north in a solid body of quartz for a short distance, the remainder being broken quartz and formation to the face. To the south it has been extended for a distance of 224 feet in a solid quartz reef which varies from 12 to 14 feet in thickness having a good hanging wall to within a short distance of the face where it gives place to formation.

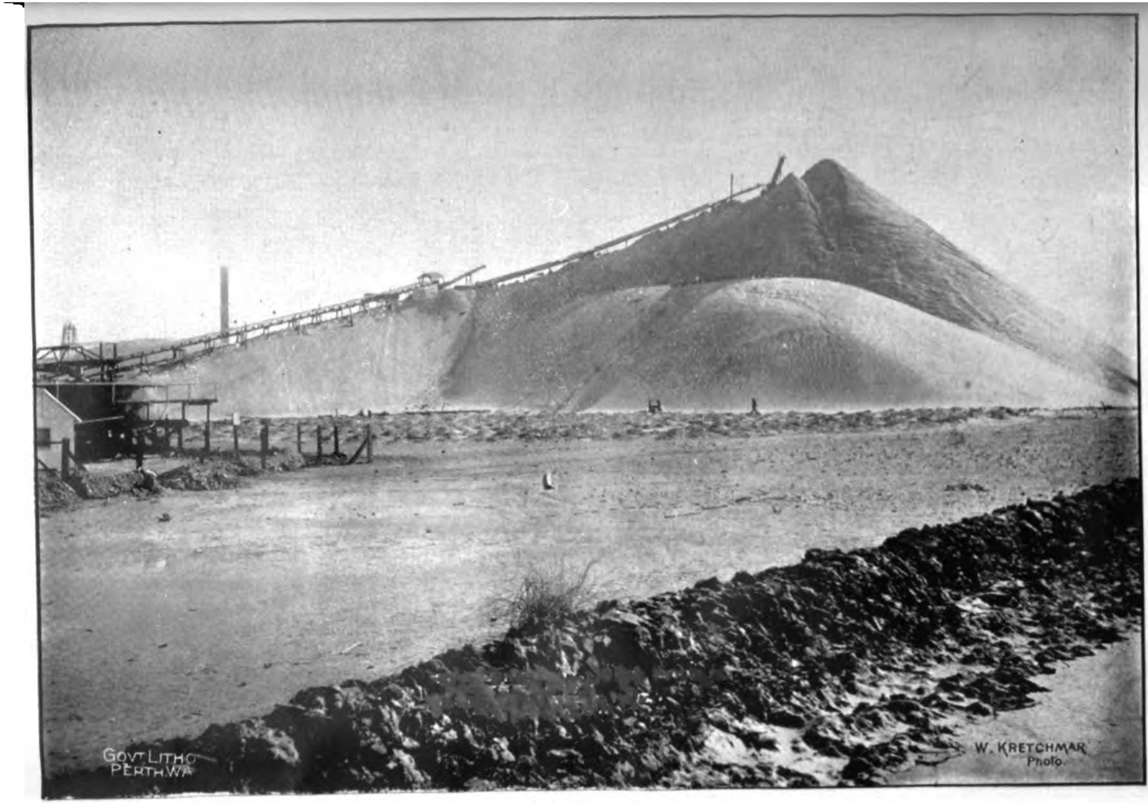
The No. 7 level is connected with the main vertical shaft at a depth of 800 feet by a crosscut 40 feet in length and the lode driven on 504 feet north in a formation 13 feet in thickness, which occasionally makes into a solid quartz body for a short distance and at one point 300 feet from the crosscut a bunch of copper pyrites was cut. The south level was driven for a distance of 427 feet and in it very little quartz was met with the lode consisting for the most part of formation 15 feet in thickness.

The country in which the lode is contained in the lower workings is a solid blockey greenstone generally without good walls. The lode in these lower workings is as a rule of low grade but of great size, including the formation which is of a schistose nature whilst the walls do not as a rule with the exception of the No. 6 south level present polished or striated surfaces.

The water level in the mine is 100 feet below the surface but in sinking the main shaft little water was encountered until the old workings were cut, whilst below the 300 feet level upon the lode the country was found to be solid and quite dry.

From this mine the official records show that 3,500 tons of stone have been crushed, which yielded on the average a little over half-an-ounce per ton of fine gold, inclusive of the sands treatment, whilst to judge from the plan the greater proportion of this came from above the No. 2 or 144 feet level, below which very little stoping has been done.

The plant upon the property consists of a 10-head battery, 4 cyanide vats, with winding engines at both shafts, boilers, pumps, etc.



Tailings Dump.

Table showing the yield of the Rubicon Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
Prior to—		Tons.	Ozs.	Ozs.
1897	Rubicon G.M.L., 138D ..	396.00	208.66	.52
1897	Do.	405.00	300.26	.74
1898	Do.	204.50	136.18	.66
1899	Rubicon Leases 138D, 166D, 167D	485.00	313.53	.64
1901	Murchison Associated G.M. Ltd., 138D, 166–7D	52.00	11.39	.22
1902	Do.	360.00	163.64	.45
1903	Do.	227.00	123.78	.54
1904	Do.	1,091.00	807.97	.74
1906	Do.	283.00	151.20	.55
	Total	**3,503.50**	**2,216.61**	**.63**

The San Diego, M.L. 1D, *now P.A.* 65D.—Upon a rough ridge to the eastward are some prospecting areas which are at present being worked for copper, upon which was originally the old Nimrod or San Diego.

The lode, which is a quartz body containing small bunches of strings of green and blue carbonate of copper, strikes in a north-west direction and dips to the south-west.

A considerable amount of work was done in the early days, but only 15.65 tons of ore were shipped, which realised £167; later on some 30 tons of stone were crushed, which yielded gold at the rate of 1½ ounces per ton.

These old workings have been reopened during the last year as P.A. 65D, and 25.21 tons of copper ore obtained from the old workings and redressing spoil heaps, which contained 10 per cent. of copper, valued at £190.

The Croesus, G.M.L. 182D.—To the northward of the Rubicon is the old Crœsus mine, which has been worked to the 100 feet level by a series of underlay shafts upon a lode which outcrops for a distance of 15 chains striking a little to the eastward of north and dipping to the westward.

This mine has not been worked since it was acquired by the Murchison Associated Company in 1899, but prior to that date over 1,000 tons of stone had been crushed, which yielded gold at the rate of nearly 1½ ounces to the ton over the tables, no returns being given of the value of the sands; it seems strange that this company has devoted all its capital upon a property in which the stone was not of half the value.

Besides the auriferous reef there is a copper lode upon this property, which crosses the south-west corner of the lease upon a course a little west of north and dips to the westward.

The vein was apparently small in size consisting mostly of quartz with a little blue and green carbonate of copper in strings, the ore needing a considerable amount of dressing.

So far as can be ascertained, only five tons of ore have been shipped, but no record is obtainable of its value, although despatched to Wallaroo in 1906.

Table showing the yield of the Crœsus Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
Prior to--		Tons.	Ozs.	Ozs.
1897	Crœsus G.M.L., 14D ..	762.00	1,309.15	1.85
1898	Do.	319.00	295.80	.92
1899	Do.	57.00	35.46	.62
	Total	**1,138.00**	**1,640.41**	**1·44**

The Day Dawn West G.M.L. 211D.—To the south-westward of the Great Fingall mine is a reef which first runs in a south-westerly direction for a distance of 8 chains, from which point it makes a turn to the westward for a length of about 3 chains, the dip in the first section being 56 degrees to the south-east and the second 30 degrees to the south.

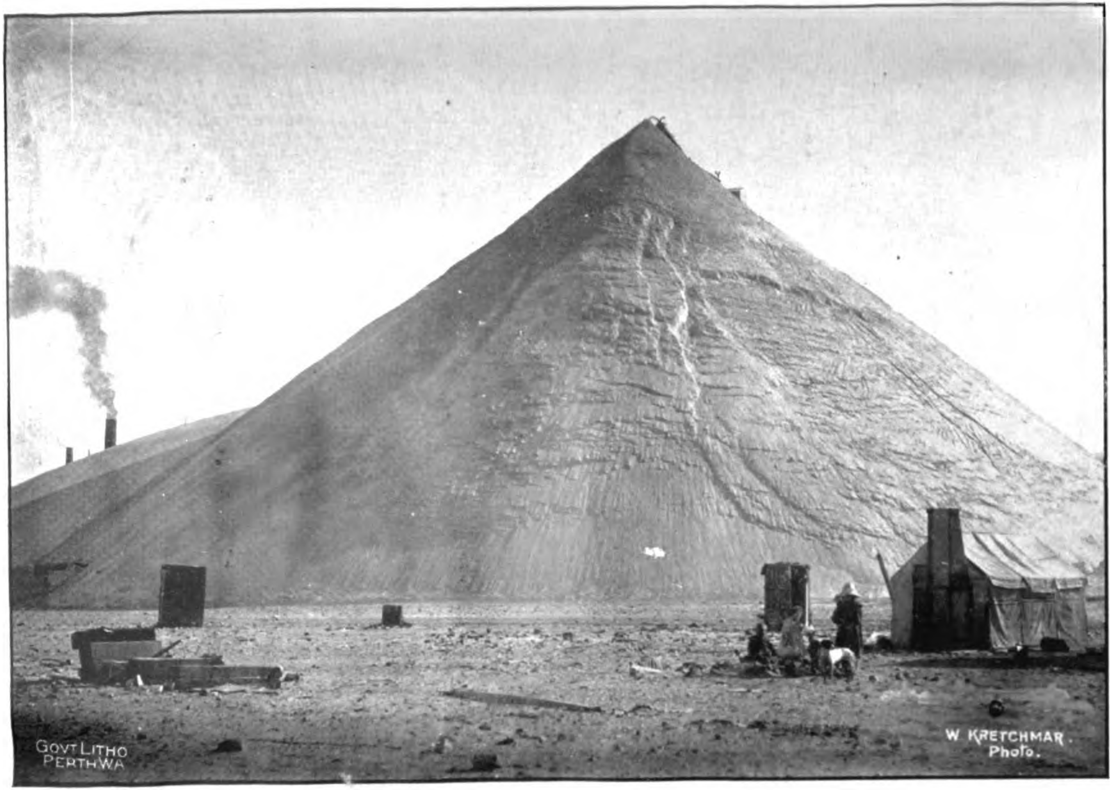
This mine was first known as the Day Dawn West, whilst later it was owned and worked by the Consolidated Murchison G.M. Ltd., until the year 1899, when it became the property of the West Fingall, Ltd., in conjunction with a number of adjoining leases, which now have all passed into the hands of the Great Fingall Consolidated. It has not been worked since the year 1898, but prior to that date considerable developments took place, these consisted first of a number of underlay and vertical shafts from the surface to the 50-feet level, which is 700 feet in length. The shoot of ore in this level has been worked for a length of 300 feet and stoped to the surface, where, however, it diminished to 150 feet in length.

The No. 2 level is connected with the bottom of Wallace's shaft, which is 85 feet in depth by a crosscut 100 feet in length, the reef being driven in for a length of 800 feet, whilst the shoot stoped between this and the No. 1 level is 300 feet in length.

Below this level this mine was worked by a main underlay shaft, which was sunk to a vertical depth of 160 feet, the No. 3 level being at 127 feet and driven for a length of 300 feet, whilst stopes of 200 feet in length were carried up to the No. 2 level, whilst a little underhand stoping was done below this level.

The No. 4 level at 155 feet from the surface was driven for a length of 250 feet, but since no stoping was done the reef apparently carried no values. Later on a crosscut was driven by the West Fingall Company, which cut this reef at the 215 feet level which was carried a length of 250 feet in apparently valueless stone.

This reef is a cross fissure running at right angles to the strike followed by the Great Fingall and the Golden Crown lines between which it lies, the values in it occurring only upon the curve at the



GOVT LITHO PERTH WA

W. KRETCHMAR. Photo.

Tailings Dump.

south end, at which point the reef dips, flattens, and turns to follow more of a normal course.

Table showing the yield of the Day Dawn West Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
Prior to—		Tons.	Ozs.	Ozs.
1897	Day Dawn West G.M.L. 7D	2,922.00	1,996.25	.68
1897	Do.	3,548.00	2,863.48	.80
1898	Do.	2,286.00	1,350.25	.59
	Total	**8,756.00**	**6,209.98**	**.71**

The Queen's Birthday G.M.L. 66D.—A short distance to the westward of the last mentioned is a main fissure line which can be traced upon a course a little west of north for a distance of over a mile, the quartz bodies in which dip to the westward and are almost continuous at the surface.

At the northern end of this line are some old workings known as the Queen's Birthday, from which 33 tons of stone were crushed yielding gold at the rate of .22 ounces per ton.

The Pelican G.M.L. 101D.—A little farther south are the old workings which were known in the early days of this field as the Pelican, from which 25 tons were raised which yielded 26.59 ounces of fine gold.

The Golden Crown G.M.L. 78D.—Farther south still is the old Golden Crown lease, which afterwards became the Fingall Deeps of the West Fingall, Ltd., and is now owned by the Great Fingall Consolidated.

The individual quartz body worked upon this lease can be traced for a length of 15 chains at the surface upon a north-west course with a dip of from 52 to 67 degrees and an average size of 2 feet.

The old workings consist of a number of underlay shafts down to the 50-feet level, which has been driven upon the lode for a length of 430 feet, and it is from here that all the stone crushed was raised.

A main vertical shaft was sunk by the West Fingall Co. to a depth of 255 feet, but since this was put down upon the outcrop of this reef it was necessary to crosscut a distance of 80 feet at the 155 feet level where the reef has been driven upon 190 feet and 110 feet at the 215 feet level, which latter is 500 feet in length.

From this level a crosscut has been driven in a north-easterly direction for a distance of 440 feet to the Day Dawn West reef, which was then followed for a length of 250 feet, but no stoping was done.

Five diamond drill bore holes were put down in hard massive amphibolite, which near the surface is schistose with green bands of epidote.

The official records show that only 110 tons of stone were crushed from this mine, which yielded 130.58 ounces of fine gold.

The Perseverance G.M.L. 174D (abandoned).—Rather over half-a-mile to the southward is what was known first as the Perseverance and later on as the Try Again, the reef in which outcrops for a length of 18 chains upon a north and south course with a dip of 80 degrees to the westward, and is in all probability the southern continuation of the Golden Crown fissure; whilst the second reef which was worked at the south-west corner of this lease is most probably the continuation of the Smith's United fissure to be next described.

The work upon this reef is all of a shallow character, but the stone raised appears to have been of good value.

Table showing the yield of the Perseverance Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		Tons.	Ozs.	Ozs.
1897	Perseverance G.M. L., 46D	37.00	22.31	.60
1899	Do.	11.50	12.73	1.10
1899	Try Again G.M.L. 174D ..	15.25	58.39	3.82
1900	Do.	28.00	15.17	.54
1901	Try Again, G.M.L. 267D ..	6.00	6.05	1.01
	Total	**97·75**	**114·65**	**1·17**

The St. Albans G.M.L. 119D.—Parallel to the last mentioned line is another fissure the quartz bodies in which are not nearly so continuous, some 20 chains of a break occurring between the northern outcrop and the southern.

At the north of this line is the old St. Albans mine, upon which the reef outcrops for a length of 10 chains, having a north-westerly course with a dip of 53 degrees to the south-west.

It was worked by two underlay shafts, sunk to a depth of 80 and 96 feet respectively, and a main vertical shaft to 125 feet, from which a crosscut has been driven at a depth of 90 feet to the lode, which was followed for a length of 320 feet.

Recent sampling by the Great Fingall Co., to whom it now belongs, proved that the reef at the 90 feet level was too poor to pay working expenses.

From this mine 43 tons of stone were crushed, which yielded 15.33 ounces of fine gold.

The main shaft is now used as a fresh water supply.

The Smith's United G.M.L. 212D.—Twenty chains to the southward upon the same line are the old workings that were known as Smith's United, the reef here still has the north-westerly strike and outcrops for a length of 18 chains dipping at an angle of 65 degrees to the westward.

The ore raised from this mine came from an opencut mainly, but nothing from below the 50-feet level, which is 70 feet in length and is connected with the main vertical shaft by a 70-feet crosscut.

The 150-feet level, which is 150 feet in length, is connected with the main shaft, which is 180 feet in depth by a 30-feet crosscut. Recent sampling of the bottom level in this mine proves that the good values met with near the surface do not continue below.

Table showing the yield of the Smith's United Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		Tons.	Ozs.	Ozs.
Prior to— 1897	Smith's United, G.M.L. 146	44.00	39.62	.90
1897	Do.	73.50	212.76	2.89
1898	Do.	40.00	106.98	2.67
1899	Do.	5.00	1.88	.37
	Total	162.50	361.24	2.22

The Golden Ridge G.M.L. 667D.—Upon a low ridge about 1¼ miles to the westward of Day Dawn are some old workings upon short reefs striking north and south with a westerly dip, known as the Great Western and Aurifer, the latter being later on called the Golden Ridge, from which 54 tons of stone were crushed yielding 28.73 ounces of fine gold.

About half-a-mile farther south upon the western side of the Rifle Range there are some more old shafts but no quartz outcrop, from which 50½ tons of stone were crushed for 28.43 ounces of fine gold. Upon the western side of the Trenton Hill are some more old workings, which include the Ada Mary or Ivy Mary, the Klondyke and the Southdown; from the former of these 89 tons of stone yielded 35.43 ounces of fine gold, and from the second 191½ tons of stone gave 73.83 ounces of fine gold, the latter upon which considerably more work was done is shown in the following table :—

Table showing the yield of the Southdown Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		Tons.	Ozs.	Ozs.
Prior to— 1897	Southdown, G.M.L. 115 ..	267.00	412.36	1.54
1897	Do.	54.00	81.78	1.51
1898	Do.	12.00	11.45	.95
1899	Southdown, G.M.L. 162 ..	96.00	131.15	1.36
	Total	429.00	636.74	1.48

The Mount Fingall G.M.L. 320D.—Upon a steep island-like hill, surrounded by a large alluvial flat about 1½ miles south of the Trenton Hill, is a mine which was originally known as the Strathmore, but now is the Mount Fingall.

The reef which crosses a saddle in the ridge strikes a little west of north and dips to the westward at an angle of from 45 to 50 degrees, the quartz varies from 2 to 7 feet in width, averaging about 4 feet, being contained in a large schistose formation which carries a little gold in places, the whole being enclosed in hard massive amphibolite.

This reef has been worked by a main underlay shaft sunk to a vertical depth of 276 feet, and a main vertical shaft 60 feet farther south to a depth of 200 feet.

The No. 1 level is at a vertical depth of 120 feet, and has been driven upon the reef for a length of 130 feet, this is the highest level that is at the present time accessible, as the upper workings have fallen in.

The No. 2 level is at a vertical depth of 200 feet, and has been driven north from the bottom of the vertical shaft for a distance of 100 feet, whilst the No. 3 level has been started from the underlay shaft at a vertical depth of 70 feet below the No. 2 level.

The water level in this mine is at 60 feet below the top of the hill, and yields 500 gallons per hour.

There is a small battery with a winding and pumping plant upon the mine.

Table showing the yield of the Mount Fingall Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		Tons.	Ozs.	Ozs.
1898	Strathmore, G.M.L. 163D ..	47.00	26.73	.51
1902	Mount Fingall, G.M.L. 273D	74.00	33.22	.45
1903	Mount Fingall, G.M.L. 320D	14.00	8.57	.61
1904	Do.	485.00	258.07	.53
1905	Do.	936.00	514.46	.65
1906	Do.	300.00	228.39	.76
	Total	**1,856.00**	**1,069.44**	**.57**

The Day Dawn G.M.L. 398D.—Upon a low hill to the westward of the racecourse is a reef that was discovered about two years ago called the Day Dawn, after the original mine of the district, which is now known as the Great Fingall.

The main reef has an east and west course for a length of four chains, and an underlay at a low angle to the northward, it has been followed down upon the underlay for a distance of 80 feet, and a vertical shaft has been sunk to a depth of 54 feet 6 inches, the water level being at 25 feet.

From the cap of this reef a flat spur or leg seems to dip to the south, giving it the appearance of a saddle formation, and it was from the apex of this that the richest stone was obtained.

A series of shafts sunk in the adjoining lease at the eastern end of the outcrop failed to cut this reef, whilst at the west end it is cut off by a reef having a north-west course, and a dip to the north-east.

The country as far as followed down is a soft schistose amphibolite, more or less weathered, and the water is quite fresh. From this lode up to the end of 1906 some 90 tons of stone had been crushed, which yielded 258.59 ounces of fine gold.

The Emperor G.M.L. 191D.—Upon the large alluvial flat which constitutes the main drainage channel between Day Dawn and Austin Lake, and about 1½ miles south-west of that town is a reef which outcrops for a length of 11 chains upon a north-westerly course with a dip of 62 degrees to the south-westward, this was from the early days of the field until last year known as the Emperor, but now is called the Fingall Extended.

The workings upon this lease consist of a number of underlay shafts to the 45 feet level, which in the year 1895 is reported to have been 70 feet in length; this, however, was extended afterwards, but has now fallen in.

A main vertical shaft has since been sunk to a depth of 200 feet, with a level 141 feet in length from its bottom; there is also a level at the 110 feet which has been driven upon the lode for a length of 264 feet, but no stoping has been done below this level and little only below the 45 feet, which was just above the original water level, this latter has now risen to within 20 feet of the surface.

The water is very salt, and is reported to have made in the year 1894 at the rate of 1,000 gallons per hour, but this has now considerably increased.

The surrounding rock is schistose amphibolite near the surface and along the lode fissure, but is very solid and blocking in the main shaft.

In the upper levels the reef was 2 feet 6 inches in thickness, but there is no information to hand as to its size in the lower workings, which are now flooded.

There was a five-head stamper battery, winding engine, pumps, etc., upon this mine, but these have now all been removed.

A diamond drill bore hole was put down to a depth of 510 feet upon this lease to test the lode at a depth, but in this no values were cut.

Table showing the yield of the Emperor Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		Tons.	Ozs.	Ozs.
Prior to— 1897	Emperor G.M.L. 15D ..	651.00	1,949.30	2.99
1897	Do.	952.45	748.41	.78
1898	Do.	25.00	24.75	.99
1899	Do.	110.25	93.36	.84
1901	Do.	28.00	12.36	.44
1903	Do.	72.00	23.08	.32
1905	Do.	11.00	23.50	2.13
	Total	**1,849.70**	**2,874.76**	**1.55**

The Trenton, G.M.L. 399D.—This property, which consists of G.M.Ls. 288D, 399D, and 400D, covers an area of 56 acres, and is situated half a mile east of the Trenton Hill sub-trig. station, and one and a half miles south-west of the Great Fingall Mine.

It was originally held by a company as G.M.L. 23D, who worked it until the year 1896, during which time 7,732 tons of stone were crushed which yielded 5,507.05 ozs. of fine gold; the sands were treated later on by the Murchison Consolidated but no record appears as to their value; they are said, however, to have gone 6dwts. per ton, which is quite possible.

The Company had a ten-head mill with pumping and winding plant.

In the year 1897 no returns appear but in 1898 the records show a return of 16 tons of stone crushed which yielded 15.55 ozs. of fine gold, the lease number appearing as 148D.

In 1899 it was voided for non-payment of rent, when the southern portion was taken up as Quartz Claims 31 and 32, and during the two succeeding years 189.10 tons of stone were crushed which yielded 171.22 ozs. of fine gold.

In 1902 no returns are given, but in 1903-4-5 this mine appears again as G.M.L. 227D, during which period 800 tons of stone were crushed which yielded 504.16 ozs. of fine gold (this includes 194 tons crushed by Mr. Thompson in 1905, which yielded 120 ozs. of gold of which no official record appears).

In 1905 it passed into the hands of the present Company, who have since devoted their entire energies to its development by sinking a main underlay shaft on the incline.

From the above it will be seen that a total of 8,746 tons of stone have been crushed from this mine which have yielded 6,198 ozs. of fine gold, which is at the rate of .71 ozs. per ton.

With the exception of the last 700 or 800 tons crushed, no record exists of the value of the sands; these are said, however, to have yielded gold at the rate of 6 dwts. to the ton when treated and this is quite possible since in the early days of this field crushing was done in a more or less crude manner.

Should this value be correct it will bring up the value of the stone crushed to close upon an ounce of gold to the ton.

The new main shaft, which is now down 408 feet, measures 12 feet by 4 feet 6 inches, its gradient for the first 300 feet being 54 degrees, but since the lode pitched below this it was altered to 64 degrees, but still remains in the hanging wall of the reef. With the exception of this, little development has been done upon this property since it was held by the old Company in the early days, most of the recent work being confined to the zone above the water level which is 80 feet.

The old main shaft was vertical and sunk to a depth of 250 feet with crosscuts 90 feet in length to the No. 1 or 100 feet level, of 5 feet to the No. 2 or 190 feet level, and of 40 feet to the No. 3 or 235 feet level, the reef being passed through immediately below the No. 2 level.

The No. 1 level has been driven for a distance of 75 feet to the north of the crosscut and 275 feet to the south, the No. 2 level 105 feet north and 90 feet south, whilst the No. 3 level has been driven 140 feet to the north, the new main shaft being broken into at 80 feet from the crosscut.

About 4 chains north of the main shaft is an old shaft which has been sunk to a vertical depth of 60 feet at the bottom of which a level was driven 20 feet north; as the reef however was much broken it was used as a water shaft on account of the water being of a better quality for boilers than that from the mine.

At 140 feet south of the main shaft is the No. 1 underlay shaft and at 60 feet farther south the No. 2; these are said to have been sunk to a depth of 80 feet, but they have now been filled up to the 60 feet intermediate level driven by the recent owners in order to work a southern shoot above the water. This level was connected with the No. 1 level by a winze but this is also filled in.

The lode strikes about 20 degrees west of north and outcrops for a distance of 10 chains, dipping at an angle of 55 degrees between the surface and the No. 1 level, at 45 degrees between the Nos. 1 and 2, and 40 degrees between Nos. 2 and 3, after which it appears to pitch since the main underlay shaft, which has been carried down at an angle of 64 degrees has not broken into it, although close upon the hanging wall at the No. 3 level.

The size of the reef varies considerably, starting small at the surface but increasing to 3 feet at the No. 1 level, 5 to 6 feet at the No. 2 level, and 8 to 12 feet at the No. 3, but at each level it either cuts out or pinches at the ends.

To judge from the plan of the workings (the southern being inaccessible) there are two shoots in this mine, the one worked by the original company has been worked out for a length of 170 feet at the surface and stoped for a length of 205 feet above the No. 1 level, and 140 feet below it above the No. 2 the stone has been stoped for a length of 175 feet, whilst below this level practically no stone appears to have been stoped.

The south shoot has been worked out for a length of 65 feet at the surface and 55 feet above the 60 feet level.

This last-mentioned shoot being situated upon abandoned Q.Cs. 31 and 32 is evidently responsible for the production of the 189 tons of stone crushed between 1899 and 1901, which yielded 171.22 ozs. of fine gold reported from these claims, it is also probable that the greater portion of the 615 tons crushed in 1903-4 which yielded 384 ozs. of fine gold also came from this portion of the mine, as the total of these two amounts practically represents the cubic contents of the stopes. The balance of 7,902 tons, which yielded 5,643 ozs. of fine gold, in all probability came from the north shoot, as nearly all of it was raised by the old company.

It will therefore be seen that the northern shoot, without the addition of the tailings, is of an equal grade to the southern, the returns from which include the cyanide extraction.

The country is extremely hard amphibolite, which necessitates the employment of rock drills ; this fact probably accounts for the original company crosscutting to the lode before reaching the 300 feet level.

There is no reliable information as to the actual value of the large body of stone met with at the No. 3 level, since with the exception of a small parcel of stone taken out by Mr. Thompson, the present company do not appear to have done any systematic sampling, but it seems strange that, unless the stone proved to be poor, the original company should have abandoned a mine, leaving a fine block of ground unstoped when all the dead work had been done and there was a battery on the ground.

It is quite possible however, that this large body of quartz, although considered to be of too low a grade to work in the early days, may pay well with the aid of modern appliances, and the point can be simply set at rest by sampling.

It will be noticed that the great increase in size of the stone occurs in that portion of the vein where the angle of dip is lowest, and probably poorest, therefore it is quite possible that richer stone but smaller in size may be met with below the bottom level where the reef pitches.

Table showing the yield of the Trenton Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
Prior to—		Tons.	Ozs.	Ozs.
1897	Trenton G.M.L. 23D ..	7,732.00	5,507.05	.71
1897	Do.	..	..	..
1898	Trenton G.M.L. 148D ..	16.00	15.55	.97
1899	Trenton Q.C. 31 and 32 ..	98.10	65.25	.66
1900	Do.	82.00	92.05	1.30
1901	Do.	9.00	13.92	1.55
1902	Do.	..	..	..
1903	Trenton G.M.L. 227D ..	460.00	181.34	.39
1904	Do.	155.00	202.66	1.76
1905	Do.	194.00	120.16	.62
	Total	**8,746.10**	**6,197.98**	**.71**

The Bonnie Scotland, G.M.L. 215D.—Close to the Cue road about half a mile north of Day Dawn, is an old shaft upon the alluvial flat which forms the main drainage channel of this belt of country. This shaft was sunk by a party who called this mine the Bonnie Scotland, but although the 6½ tons crushed from it yielded 13 ounces of fine gold, it is now used as a well and the surface as a market garden.

The White Horse, G.M.L. 331D.—A little south of the last-mentioned, just within the township area, is a large quartz blow which strikes from east to west and dips to the south; this was called first the White Horse and later on the New Fingall. Several shafts have been sunk upon it, but since the vein appears to flatten and cut out in depth and to be of low value, it has been abandoned. In all some 22 tons of stone were crushed, which yielded 14.60 ounces of fine gold.

East Fingall G.M., Ltd., G.M.L. 26D, *etc.*—Upon the other side of the railway line from the last mentioned in the Eureka No. 5, now the property of the East Fingall G.M., Ltd., who are at present engaged in testing the Eureka lode at a depth.

This reef has a course a little to the east of north and underlies to the west at an angle of 58 degrees from the first 100 feet and at 35 degrees at the bottom of the winze, it was worked by a main vertical shaft 100 feet in depth and two underlay shafts to the No. 1 or 60 feet level, which is 390 feet in length, above which the lode has been stoped to the surface for a length of 250 feet.

The No. 2 or 100 feet level was driven upon the lode for a length of 280 feet, of which 120 feet was good ore, and stoped up to the No. I level. The 120 feet or No. 2 intermediate level has been driven from a winze sunk upon the lode from the 100 feet level; it is 160 feet in length, nearly the whole of which was good ore, and has been stoped up to the No. 2 level.

At a vertical depth of 140 feet, the No. 3 level has been driven from the same winze for a distance of 25 feet north and 15 feet south, but no stoping has as yet been done.. The winze was then carried down for a further distance of 100 feet, making a total of 320 feet upon the plane of the lode.

With the object of cutting this reef at a depth a shaft was sunk upon the adjoining lease, G.M.L. 264D to the westward at a distance of 540 feet, which shaft has now reached a depth of 650 feet.

From this shaft a crosscut was driven at a depth of 250 feet for a distance of 200 feet east, in which two quartz veins were cut, both dipping to the westward but carrying only small values ; had this crosscut been carried on for another 40 feet it would in all probability have cut the Eureka lode, but owing to the fact that such a heavy supply of water was cut in this drive, which materially interfered with the shaft sinking, it was therefore dammed up.

At a depth of 400 feet a crosscut was driven east, which cut a quartz vein at a distance of 15 feet from the shaft; this was driven on for 15 feet north and 25 feet south. At 55 feet from the shaft in the same crosscut the Eureka lode, carrying values, was cut and driven on for a distance of 70 feet north, at which point a winze connects it with the 500 feet level. A little below this level the reef was cut in the shaft where it was three feet in width and assayed 3 ounces.

At a depth of 500 feet a crosscut was driven 110 feet west, which cut the Eureka lode, carrying values, at a distance of 45 feet from the shaft, and this was driven upon 130 feet south and 160 feet north.

In the north drive the reef, which varied from 1 foot to 18 inches in width, assayed upon the average from 30 to 35 dwts. of gold per ton for a length of 110 feet, some assays going as high as from 4 to 8 ounces. At a point about 40 feet north of the crosscut a winze was sunk upon the vein to a depth of 110 feet, the stone from which assayed between 5 and 6 dwts of gold per ton.

One hundred feet north of the crosscut another winze has been sunk to a depth of 45 feet, but in this the stone carried only very small values, whilst at the north face of the level the veins are cut off by a slide. At a point about 70 feet north of the crosscut a rise was put up to the 400 feet level, in which the stone carried values for the whole distance.

A crosscut was also driven at this level for a distance of 140 feet east of the shaft which cut a second body of quartz at a distance of 60 feet, and this was driven upon 150 feet north upon only low values.

At a depth of 650 feet a crosscut was driven for a distance of 110 feet east and 145 feet west, but the latter will have another 65 feet to go before it cuts the lode if this still continues upon the same dip.

It is most satisfactory to find that this reef is carrying values, although low, down to a depth of 600 feet since it is quite possible that much richer portions may be met with when the lode is further developed.

There is a winding engine, boilers, and compressor upon this mine and the remains of an old battery.

Table showing the yield of the Eureka Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		Tons.	Ozs.	Ozs.
1897	Eureka No. 5 G.M.L. 26D	151.75	206.35	1.36
1898	Do.	215.00	207.49	.96
1899	Do.	582.50	617.74	1.06
1900	Do.	251.00	207.40	.82
1901	Do	80.00	53.51	.67
1906	East Fingall G.M.L. 234D ..	1,208.00	709.19	.58
	Total	**2,488.25**	**2.001.68**	**.8**

The Creme d' Or, G.M.L. 389D.—A little to the southward of the Eureka is an old mine which has been worked off and on for the last 10 years; it is situated close to the railway station upon the eastern side of the yard.

The reef strikes to the north-west and south-east with a dip of 55 degrees in the upper workings and 69 degrees in the winze.

The water level in this mine is 60 feet below the surface, and above this all the ore has been stoped for a length of 250 feet, but these old workings have now completely fallen in.

From the bottom of the old workings a winze has been sunk for a further depth of 90 feet, in which the reef varies from 16 inches to 3 feet in thickness and assays from 32 dwts. to 2 ounces. In sinking this winze the country rock was schistose amphibolite, but a hard black dyke was found to pass through the reef which proved, upon microscopic examination, to be an augite andesite, thus belonging to the volcanic series.

A main vertical shaft has been sunk to a depth of 200 feet from the bottom of which a crosscut is being driven to the reef, which it is expected will be cut in a distance of 80 feet.

There is a small five head battery upon this mine besides a winding engine and pumps.

Table showing the yield of the Creme d'Or Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		Tons	Ozs.	Ozs.
Prior to— 1897	Creme d' Or G.M.L., 22D	..	..	..
1897	Do.	21.50	17.40	.80
1898	Do.	134.00	80.27	.59
1899	Do.	61.00	46.12	.75
1900	Do.	26.50	23.38	.80
1903	Do. .. ., 330D	20.00	5.98	.29
1904	Do.	21.00	5.05	.23
1905	Do.	35.00	42.00	1.41
1906	Do. 389D	79.00	72.86	.92
	Total	**398.00**	**300.58**	**.75**

The New Ballarat, G.M.L. 241D.—Adjoining the Creme d' Or upon the south is a lease upon which a reef boldly outcrops, having a north-westerly strike for a length of 9 chains with a dip to the westward.

It has been worked from two or three shallow underlay shafts and a vertical shaft, from which 124 tons of stone were treated, which yielded 116.90 ounces of fine gold, equal to .94 ounces per ton.

The New Caledonia, or Last Chance, G.M.L. 244D (abandoned). —Upon the same line of country as the last, but about ¼ mile to the south-west of the town, are a series of old workings upon what appears to have been a ferruginous decomposed outcrop about 8 chains in length, having a north-easterly course with a dip varying from 50 to 75 degrees to the westward, the vein being about 15 inches in width in decomposed schistose country.

It was worked by opencuts and underlay shafts to the water level, the surface of which is said to have been very rich, from which some 700 ounces of gold are reported to have been dollied in the early days of the field when it was known as the Mullochy Leader, but of this no official record exists.

Table showing the yield of the Last Chance Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate ton
Prior to—		Tons.	Ozs.	Ozs.
1897	New Caledonia G.M.L., 157D	70.00	60.51	.8
1897	Do.	85.00	20.06	.2
1898	Do.	..	5.42	
1905	Last Chance G.M.L., 369D	111.00	41.93	.3
	Total	**266.00**	**127.92**	**.4**

The Caledonian, late Phoenix, G.M.L. 350D.—Still upon the same belt of country and almost adjoining to the southward is a reef which was worked as far back as 1894 by the Cue Victory G.M. Co., and later on by the Yalgoo Proprietary Syndicate.

The reef strikes in a north and south direction and underlays to the westward at an angle of 54 degrees, being of an average thickness of two feet six inches in schistose amphibolite country, the water level being 40 feet below the surface.

It has been worked by a main vertical shaft to a depth of 75 feet and four underlays to the water level, at which depth the reef has been driven for a distance of 130 feet.

It is reported that some 500 or 600 ounces of gold were taken from its cap in the early days before records were kept.

Table showing the yield of the Caledonian Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
Prior to—		Tons.	Ozs.	Ozs.
1897	Yalgoo Proprietary Prospecting Syndicate, Ltd., G.M.L., 12D	569.00	684.97	1.20
1897	Do.	97.00	90.25	.92
1898	Do.	54.00	31.00	.57
1899	Phœnix G.M.L., 173D ..	40.00	353.00	8.84
1900	Do.	..	254.00	..
1904	Caledonian G.M.L., 350D ..	..	12.51	..
	Total	**760.00**	**1,425.74**	**1.87**

Sailor Lad, G.M.L. (560) 134D (abandoned).—A little to the eastward of the Eureka No. 5 upon the side of the hill are some old workings which were known in the year 1898 as the Sailor Lad, the reef upon which strikes in a north and south direction and underlays to the westward. It was worked by several shallow shafts and open cuts from which 48 tons of stone were raised, which yielded 53.59 ounces of fine gold, which is at the rate of 1.11 ounces per ton.

The Ironclad, late King Edward VII., G.M.L. 412D.—Almost immediately to the north of the last-mentioned are a line of old workings upon a reef which strikes in a north-easterly direction and dips to the westward.

It was first worked as Edward VII., then as King Edward VII., but was again taken up last year as the Ironclad and Ironclad North.

Table showing the yield of the Edward VII. Reef.

Year.	Name and Number of Lease.	Ore crushed.	Gold therefrom.	Rate per ton.
		Tons.	Ozs.	Ozs.
1901	Edward VII. G.M.L. 214D	..	44.34	
1902	Do.	30.00	33.99	1.13
1903	King Edward VII. G.M.L. 322D	54.00	42.16	.78
1906	Ironclad G.M.L. 413D ..	47.00	4.33	.09
1906	Ironclad, North, G.M.L. 412D	50.00	36.22	.72
	Total	**181.00**	**161.04**	**.89**

The Kinsella, G.M.L. 179D.—Upon the southern point of a ridge about 1½ miles to the south-east of Day Dawn, is one of the oldest mines in this district; it is mentioned by Mr. Goczel in 1894, who states that at the time of his visit there were from "400 to 500 tons of promising looking stone at grass, and that the water level was 43 feet in vertical depth, the water being fresh"; this however has changed into salt at a depth.

As early as 1895 a 10-head battery was erected with other plant upon the ground to the value of £8,460; since that time, however, the property has changed hands several times, the machinery being augmented by the addition of another 10-head of stamps and a winding and pumping plant, the latter being capable of coping with the 80,000 gallons of water which this mine makes in the 24 hours.

The country in which the lode is enclosed is schistose amphibolite near the surface, but it is very solid and blocky below the water level, except near the fissure.

The reef has an outcrop of 27 chains in length, striking a little to the east of north and dipping to the eastward at an angle of 76 degrees in the pumping shaft between the No. 3 level and the surface whilst at the main shaft the reef goes down practically vertically to the No. 3 level, after which it flattens to an average dip of 58 degrees to the No. 4 level.

This reef has been tested from the surface by a number of shallow shafts and trenches, also by a whip shaft at the south end to the 100 feet level, a pump underlay shaft to the 170 feet level, and a main vertical shaft to a depth of 360 feet.

The main shaft is connected with all the levels, the No. 1 or 45 feet level being reached by a crosscut 30 feet in length, from which point the lode, which varies from 5ft. 6in. to 8ft. in thickness, was driven on for a distance of 255 feet north, 70 feet of which from either side of the pumping shaft being stoped up to the surface.

Appendix I.

Registered Number.	Slide Number.	Name of Rock.	Locality.
		LIST OF CUE ROCKS.	
72	40	Chloritic schist ...	Cue
73	41	Hornblende andesite	Cue Hill
74	42	Do do	do
75	...	Blue quartz	Cue
76	347	Quartzite	do
77	43	Do	do
80	...	Lode-formation ...	Lady Mary Mine
82	...	Auriferous quartz ...	Salisbury Mine
84	45	Grano-diorite ...	Gem of Cue Mine
3796	258†	Do	Agamemnon Mine
3797	259†	Porphyry	Duke of York Mine
3798	260	Do	do
3799	261	Grano-diorite ...	Geo. Higginbotham Mine
3800	262	Chloritic schist ...	Red, White, and Blue Mine
3801	...	Quartz in chloritic schist	do do
3802	...	Quartz in grano-diorite	do do
3803	...	Grano-diorite ...	do do
3804	...	Amphibolite	do do
3805	...	Quartz and green mica	Victoria Mine
3806	...	Quartz	Campania Mine
3807	...	Do	Salisbury Mine
3808	...	Do	Real Mackay Mine
3809	...	Weathered basic dyke	do
3810	...	Decomposed felsite ...	New Volunteer Mine
3811	...	Grano-diorite ...	Cue One Mine, footwall, 230ft. level
3812	...	Do ...	Cue One Mine, hanging wall, 230ft. level
3813	....	Crushed basic dyke ...	Cue One Mine, parting in reef, 230ft. level
3814	...	Weathered porphyry	Duke of York Mine
3815	...	Quartz	Cue One Mine, 200ft. level
3816	...	Do	do 300ft. level
3817	...	Ironstone	Princess Extended Mine
3818	...	Hornblende andesite	Cue Hill
3820	...	Amphibolite	Rose of England Mine
3821	...	Do	do
3822	...	Felsite	do
3823	263†	Hornblende andesite	New Princess Extended Mine
3824	...	Amphibolite	May Bell Mine
3829	...	Gabbro	Hill between Lady Forrest and Polar Star
3832	267†	Do	Hill between Lady Forrest and Polar Star
3833	268	Epidiorite	Queenslander Mine
3834	...	Weathered greenstone	Recreation Reserve
3835	269	Epidiorite	Polar Star Mine
3842	...	Epidiorite	Water Reserve 7748
3845	...	Porphyry	Near G.M.L. 653
3846	...	Epidiorite	Water Reserve 7748
3847	271†	Do	do do

† Analysed. *See* page 53.

APPENDIX I.—*continued.*

Registered Number.	Slide Number.	Name of Rock.	Locality.
		LIST OF CUE ROCKS—*continued.*	
3874	...	Porphyry	Mitcham Mine
3875	...	Do	do
3876	...	Do	Normanby Mine
3877	...	Quartzite	Near Racecourse
3878	...	Grano-diorite ...	Homeward Bound Mine
3880	275	Epidiorite	Cue and Day Dawn Road
3881	276	Amphibolite	Lady Forrest Mine
3882	...	Epidiorite	Homeward Bound Mine
3883	...	Do	Cue-Day Dawn Road
3884	...	Do	do
3887	...	Laterite	Rifle Range
3888	...	Ironstone vein ...	Fleur de Mai Mine
3889	...	Ironstone vein conglomerate	do
3890	...	Grano-diorite ...	Light of Asia Mine
3891	...	Quartz	Light of Asia Mine 295 ft. level
3892	...	Serpentine schist ...	Catalpa Mine
3893	...	Quartz	do
3894	...	Amphibolite	Rifle Range
3897	...	Quartz	do
4586	751	Amphibolite	Bores at Cue near Volunteer Group, depth 486 ft.
4586	752	Grano diorite ...	Bores at Cue near Volunteer Group, depth 999 ft.
4586	297	Do	Bores at Cue near Volunteer Group, depth 536 ft.
4586	334	Do	Bores at Cue near Volunteer Group, depth 823 ft.
4586	335	Chloritic schist ...	Bores at Cue near Volunteer Group, depth 960 ft.
6850	...	Grano diorite ...	Argus Mine
6851	...	Felspar-porphyry (weathered) ...	Lombardy Mine
6852	...	Amphibolite with pyrites	do
6853	...	Amphibolite with calcite	do
6854	...	Quartz with calcite ...	do
6855	...	Lode mattern with pyrites	do
6856	...	Felspar porphyry ...	Gem Mine
6857	...	Do ...	Red, White, and Blue Mine
6858	719†	Epidiorite	do
6859	...	Amphibolite with pyrites	do
6860	...	Chloritic schist ...	do
6861	...	Felspar porphyry ...	do
6862	749	Amphibolite	Strathmore Mine
6863	...	Weathered schist ...	Two Nations Mine
6864	...	Quartzite	M.H.L. 10
6865	...	Do	do
6866	...	Felspar porphyry ...	Polar Star

† Analysed. *See* page 53.

APPENDIX I.—*continued.*

Registered Number.	Slide Number.	Name of Rock.	Locality.
		List of Day Dawn Rocks—*continued.*	
3859	..	Quartz	Great Fingall, 640ft. level
3860	...	Amphibolite	do do
3861	...	Quartz	do do
3862	...	Crushed amphibolite	do 540ft. level
3863	...	Do	do do
3864	...	Do	do do
3865	...	Graphitic schist ...	do do
3866	...	Do	do do
3867	...	Amphibolite with iron pyrites	do do
3868	...	Amphibolite with iron pyrites	do do
3869	...	Amphibolite with iron calcite	do do
3870	...	Weathered amphibolite	do 80 ft.
3871	...	Weathered amphibolite	do do
3872	...	Graphitic schist ...	do do
3873	...	Do do ...	do do
3885	...	Mica-chloritic schist	Little Wonder Mine
3886	277†	Porphyry	do do
3895	...	Amphibolite	G.M.L. 336
3896	...	Do	Creme d'Or Mine
3898	...	Tourmaline in Amphibolite	Emperor Mine
3951	273	Amphibolite	Great Fingall
3952	278	Epidiorite	Little Wonder Mine
3976	†	Felspar porphyry ...	G.M.L. 226D
6900	726	Hornblende andesite	Trenton Hill
6901	727	Do do	do
6902	...	Felspar porphyry ...	Rifle Range
6973	725†	Augite andesite ..	Creme d'Or Mine
6974	...	Chloritic schist with graphite	No. 9 level, Great Fingall Mine

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† Analysed. *See* page 53.

Appendix II.

NOTES ON SOME TYPICAL CUE ROCKS.

By Edward S. Simpson, B.E., F.C.S., Mineralogist and Assayer.

Sub-acid Rocks.—No true acid granites or their offshoots appear amongst the Cue rocks in the collection, the most acidic rocks are a grano-diorite from a large intrusive mass and sundry dyke rocks of the same magmatic type.

[3976.] *Grano-diorite, Agamemnon, G.M.L.* 1047.—A coarse grey granitoid rock. In hand specimens quartz, felspar, hornblende and biotite are readily distinguished and the rock would naturally be looked upon as a granite. The analysis, however (in the accompanying table), shows that the silica percentage is low for such a rock, being only 63, whilst a calculation shows that the ratio orthoclase to albite to anorthite would be 1 to 5 to 2 under ideal conditions of crystallisation. Under the microscope the rock appears to have a typical coarse granitic structure. The chief constituents are: plagioclase, very slightly clouded, frequently multiply twinned, often exhibiting a zonal structure. Orthoclase, a few large singly-twinned crystals. Quartz, this is the most important constituent after plagioclase. Hornblende is plentiful in large well defined crystals, frequently twinned. Biotite is as common as hornblende, and is developed in coarse ragged-edged masses.

This grano-diorite encloses dark fine grained segregations, the boundaries of which are sharply defined though not marked by any plane of cleavage. A section through the junction in specimen [6883] from Countess, G.M.L. 1066, emphasises the fact of there being no dividing line, coarse crystals on one side being interwoven with finer crystals on the other. The segregation appears to be composed of the same minerals as the coarse rock in similar proportions. The dark colour to the unaided eye being due to the more general distribution of fine crystals of hornblende and biotite. No analysis has been made of an unaltered segregation.

[6885.] *Grano-diorite segregation, Countess, G.M.L.* 1066.—This segregation, which is extremely fine grained and of a dark greenish grey colour, has evidently been metamorphosed. In a hand specimen traces of foliation are apparent, whilst the analysis shows the presence of a considerable amount of carbonic acid, combined water and pyrites. Apart from these added constituents the rock agrees very closely with the coarse grano-diorite in composition. Under the microscope it is seen to be a finely granular mixture of felspar, quartz, hornblende, calcite, mica, and a little pyrites. It has the appearance of having been much crushed.

Three dyke rocks of the grano-diorite type have been analysed with the results shown in the table attached; they are numbered [3797], [3976], and [6880].

[3797.] *Quartz-mica Porphyry, Duke of York, G.M.L.* 1287.—This is a grey rock with crypto-crystalline base and abundant phenocrysts of biotite. A closer inspection reveals numerous grains of quartz and occasional crystals of felspar. An analysis of this rock is given in the accompanying table. Though more siliceous than the main mass of grano-diorite, the relative proportions of the various felspar molecules as well as the mineral constitution of the rock lead one to class it with the grano-diorite, bearing in mind that narrow offshoots of such rocks are likely to differ somewhat in composition from the main mass and are usually more siliceous. Under the microscope the rock is seen to consist of a very finely granular base in which are embedded numerous phenocrysts. The most common of these is quartz with somewhat less numbers of biotite and felspar. The felspar is mostly untwinned; one crystal however showed single twinning.

[3976.] *Felspar Porphyry, G.M.L.* 226.—A fine grained grey rock in which the porphyritic structure is not very evident. It is a bore core from a depth of 2,030 feet. It appears to have been crushed, and the analysis shows that considerable alteration has taken place in it. It is less acid than the porphyry previously described and approaches very closely the grano-diorite in composition. Under the microscope it is seen to be composed of small grains of varying size of felspars, quartz, hornblende, biotite, and iron ores. Owing to the variable size of the components the porphyritic structure is not very evident but large crystals of felspar, some at least plagioclase, are present. There is every indication of the rock having been crushed considerably.

[6880]. *Oligoclase Pegmatite, West of Lily, G.M.L.* 1494.—This interesting rock is pale greenish grey in colour, and finely granular. It weathers with a brown, much pitted surface like a limestone. Its analysis, shown in the table, indicates its relationship to the grano-diorite. Calculation would point to the existence in it of somewhere about 70 per cent. of oligoclase. A section shows it to be composed mainly of a single felspar, oligoclase, in fairly coarse grains. Numerous crystals of a yellow epidote are also present.

Basic Rocks.—Four types of these have been analysed, the first of which belongs to a large mass, two others are from small dykes, whilst the fourth appears to represent a surface lava flow.

[6858]. *Quartz diorite (Epidiorite?) Red, White and Blue, G.M.L.* 745.—This is a green rock of medium grain in which hornblende, felspar, and some quartz are all visible to the unaided eye. The felspar is occasionally porphyritic. Judging by its chemical composition this rock has not been subject to any great chemical change as a whole. Internal rearrangement of the constituents may have taken place, however, and the hornblende and quartz are both very possibly secondary, in which case the rock is not a true diorite but an epidiorite. A thin section shows that green and yellow *horn-*

blende and cloudy plagioclase are about equally abundant. In neither case are the crystal boundaries very sharply defined. Quartz is fairly frequent and is never idiomorphic.

[6870]. *Epidiorite, Polar Star, G.M.L.* 1277.—This rock is very similar in hand specimens to [6353] except that it is distinctly coarser in grain and the tendency of the felspar to form occasional larger crystals more apparent. There is no appearance of foliation, and the analysis shows that carbonic acid and combined water are almost absent. The most notable feature of the analysis is the very large percentage of alumina present. The amphibole present is probably therefore of the highly aluminous variety, edenite. In respect of the high proportion of alumina this rock differs essentially from [6858] and closely resembles [6374] and [3847] described below. In thin section it is seen to contain a large proportion of fibrous and ragged amphibole which is quite colourless, except for one or two small portions of crystals which are pale green. Two felspars are abundant. One very much clouded and showing no signs of twinning, the other perfectly clear and multiply twinned. This is probably secondary albite. The rock is evidently a highly metamorphosed intrusive.

[6874]. *Epidiorite, Homeward Bound, G.M.L.* 1211.—This rock is rather coarse grained and greenish grey in colour. Felspar and amphibole are readily perceived in hand specimens. In composition it is practically identical with [6870]. Under the microscope the colourless or almost colourless amphibole (edenite?) is plainly seen to be secondary, the masses of it being very fibrous or composed of a felted mass of minute spicules. Original felspars are represented by much-clouded areas, but newer felspar, very clear and multiply twinned, is one of the most important constituents. A little iron ore is present.

[3847]. *Epidiorite schist, Water Reserve* 7745.—This is a coarse-grained rock of the same type as the two previously described but the arrangement of the amphibole crystals gives a banded appearance to the rock. In composition it agrees also with [6870] and [6874]. Under the microscope it is seen to be composed of coarse grains of much-clouded felspar and pale fibrous amphibole. No quartz and only a very little secondary felspar was observed.

[3832]. *Gabbro*, north side of hill between *Lady Forrest, G.M.L.* 1051, and *Polar Star, G.M.L.* 1277.—This rock was provisionally classed as a norite in Bulletin No. 14, but a detailed examination shows that it is to be classed as a gabbro, the chief ferro-magnesian constituent being diallage. In chemical composition it is very like the quartz diorite [6858]. It is a coarse-grained brownish black rock which, under the microscope, is seen to be very fresh and free from alteration, uniformly coarse-grained, and composed of about equal proportions of plagioclase and diallage. The latter in sections approximately vertical, is pale green with numerous parallel strings of inclusions, non-pleochroic and having a large extinction angle. In sections approximately basal it is strongly pleochroic, pale green, changing to bright brownish pink, and possessing typical cleavage. The felspar is very fresh and multiply twinned. A very little hornblende and iron ore are present.

[6973]. *Augite Andesite, Creme d'Or, G.M.L.* 389D.—This is a very fine-grained black rock in which small spicules of felspar only are clearly visible to the unaided eye. Under the microscope it is seen to be composed of a fine-grained base of augite and iron ore, the latter largely dendritic, and in this base are embedded numerous larger crystals of perfectly transparent multiply twinned plagioclase. Augite phenocrysts also occur somewhat frequently. No olivine or glass could be detected.

[73] and [3823]. *Hornblende Andesite,* near Trig Hill.—This is a dark green aphanitic rock which in hand specimens has every appearance of being part of a lava flow. It has a subconchoidal fracture with indications of flow structure in places, and in others a pseudo-brecciated structure, as if portions of the rock had solidified and then been resubmerged in the still molten portion. In composition it is not very similar to any other of the rocks examined. Under the microscope it is seen to be composed very largely of fine-grained green hornblende with felspar both in the fine ground mass and in lath-like porphyritic crystals, the latter are very fresh looking and have a rough parallelism. No glass or iron ores are apparent.

G.S.M. No....	3797	6880	6874	6885	3796	3832		3976	3823	3847	6870	6858	6973
G.S.L. No. ...	2168B	3089B	3088B	3090B	3836A	3851A		3953A	3861A	3849A	2114B	2150B	3404B
Name ...	Quartz-mica Poryhyry.	Oligoclase Pegmatite.	Epidiorite.	Dark Segregation in Namodiaite, somewhat foliated.	Coarse Granodiorite.	Gabbro.		Felspar Porphyry.	Hornblende Andesite.	Epidiorite Schist.	Epidiorite.	Quartz diorite (Epidiorite ?)	Augite Andesite.
Locality	Duke of York G.M.L. 1287.	W. of Lily G.M.L. 1494.	Homeward Bound G.M.L 1211.	Countess G.M.L. 1066.	Agamemnon G.M.L. 1047.	N. side of Hill, bet. Lady Forrest and Polar Star G.M.Ls.		2030ft. D.D.B. G.M.L. 226	9 chs. S. of Princess Extended G.M.L. 1232.	Water Reserve. 7745.	Polar Star G.M.L. 1277.	Red, White, and Blue G.M.L. 745.	Creme d'Or G.M.L. 389.
SiO_2	74·86	66·43	46·27	57·25	63·62	50·12	SiO_2	68·46	48·10	48·09	46·44	52·31	50·80
TiO_2	·13	·68	·49	·52	·72	·26	TiO_2	·61	·41	·12	·42	·41	2·49
CO_2	·03	*Nil*	·25	5·21	*Nil*	·03	CO_2	2·00	·12	·12	·24	·05	·29
P_2O_5	·15	·40	·11	·23	n.d.	n.d.	P_2O_5	n.d.	n.d.	n.d.	·36	·31	·68
H_2O comb. ...	·13	·26	1·17	1·05	·06	·03	H_2Ox	·83	·33	2·05	·06	·88	·93
K_2O	3·07	·35	·13	2·90	1·20	·08	K_2O	2·05	·14	·07	·10	·59	1·56
Na_2O	4·33	6·35	1·52	2·19	4·40	1·95	Na_2O	4·01	2·11	2·17	1·05	2·57	2·41
CaO	1·18	5·88	14 89	6·49	5·43	13·04	CaO	2·63	12·73	11·30	15·18	9·32	8·31
MgO	·42	1·60	6·65	2·88	3·13	10·00	MgO	2·08	6·38	7·56	9·19	8·90	4·61
MnO	·19	*Nil*	·32	·23	·28	·29	MnO	trace	·05	·29	·22	·29	·09
FeO	·36	1·17	3·51	3·51	3·47	7·01	FeO	3·20	4·33	6·99	3·99	5·87	12·13
Fe_2O_3 ...	1·12	·54	1·36	·84	3·29	1·66	Fe_2O_3	2·27	10·32	1·43	1·91	3·09	2·91
Al_2O_3 ...	14·01	16·22	23·85	14·65	14·38	14·90	Al_2O_3	12·25	15·41	19·77	20·22	14·64	11·63
FeS_2	·04	·04	·08	·95	*Nil*	·13	FeS_2	·15	·25	·11	·20	·02	·26
H_2O Hyg. ...	·24	·20	·11	·12	·22	·13	H_2O-	·05	·04	·17	·18	·25	·71
Total ...	100·26	100·12	100·71	99·02	100·20	99·63	...	100·59	100·92	100·24	99·76	99·50	99·81
Calcd. Orthoc.	18·35	1·95	...	17·24	7·23	·45	...	11·68	·78	...	·56	3·34	9·17
,, Albite	36·68	53·71	...	18·34	37·20	16·24	...	34·06	17·82	...	8·91	22·01	20·44
,, Anorth.	5·84	15·01	...	21·41	15 85	31·69	...	9·45	32·25	...	50·04	26·41	16·40
Excess CaO...	(Al_2O_3 2·14)	2·85	...	2·20	...	...	...	·65	6·25	...			
Sp. Gr. ...	2·63	2·70	2·90	2·70	2·76	3·02	...	2·74	3·11	2·98	3·03	3·00	2·96
Analyst ...	E.S.S.	C.C.W.	J.H.B.	C.C.W.	E.S.S.	E.S.S.	...	C.C.W.	C.C.W.	C.C.W.	J.H.B.	E.S.S.	C.C.W.
No. of Section	259	734	721	722	258	267	...	286/7	263	271	720	719	728

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BULLETIN NO 29 PLATE III
PART 1.

BULLETIN Nº 29 PLATE VII.
PART 1.

THE HON. H. GREGORY. M. L. A
Minister for Mines

PLAN & SECTIONS OF
CUE VICTORY G.M.
CUE
MURCHISON G. F.

100 200 300
Scale of Feet.

ped on Golden Stream Lode...................... ▨

on Commonwealth Lode...................... ▧

BULLETIN N°29 PLATE IX.
PART 1

G. M.

ULLETIN No 29 PLATE XI
PART 1.

A. Gibb Maitland
Government Geologist

[illegible]

rnment Lithographer. Perth W. A.

BULLETIN NO 29 PLATE XII
PART 1.

G. M.

BULLETIN N°29 PLATE XIV.
PART 1.

BULLETIN Nº 29 PLATE II
PART 2

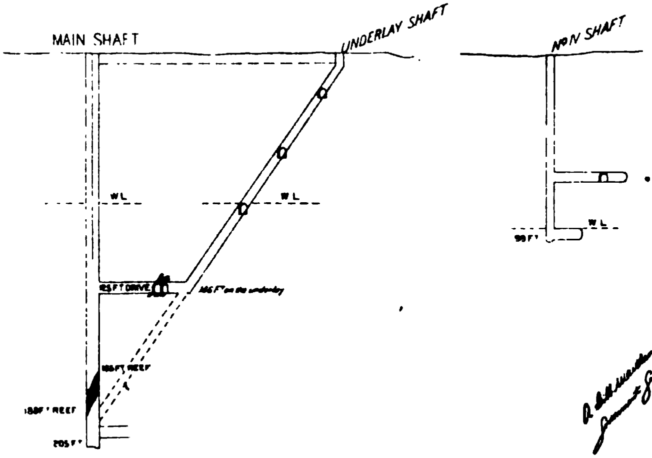
THE HON H GREGORY, M L A.
Minister for Mines

SECTIONS OF
THE Gt FINGALL ASSOCIATED G.M.

G.M.L. 334ᴰ / 194ᴰ
DAY DAWN
MURCHISON G.F.

0 100 200 300
Scale of Feet.

LONGITUDINAL SECTION CROSS SECTION



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H. J. Pether, Government Lithographer, Perth. W. A.

BULLETIN Nº 29 PLATE VI
PART 2

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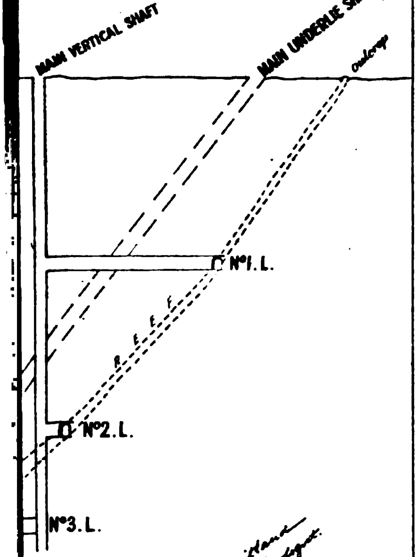

A. Gibb Maitland
Government Geologist.

R.E. Gray del.

ther. Government Lithographer. Perth. W.A.

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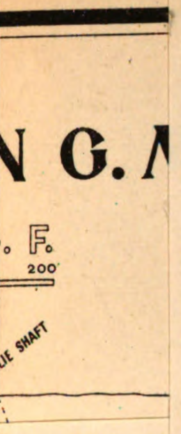
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